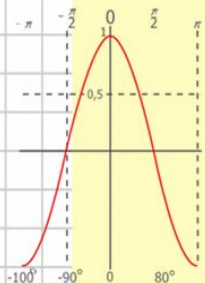
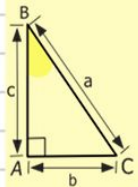
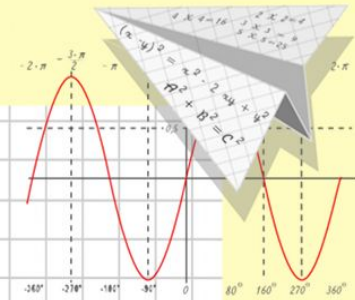
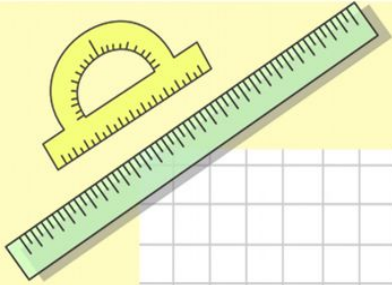


Математик

а

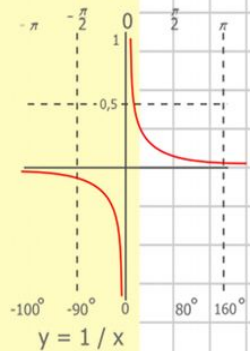
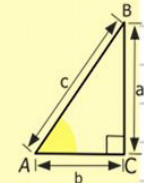
Натуральные логарифмы

Расширить понятие логарифма, для этого введя понятие натурального логарифма, выяснить взаимное расположение графиков функции натурального логарифма и показательной, научиться использовать свойства для вычисления натуральных логарифмов



$$y = \cos x$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64



$$\begin{array}{r} 1 \\ \times 2500 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

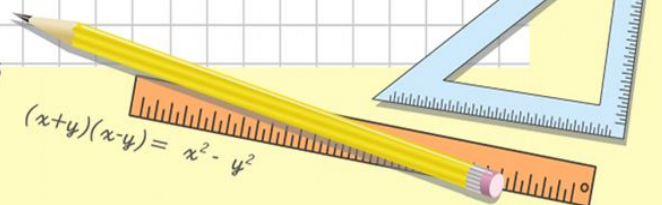


$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$



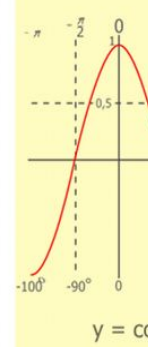
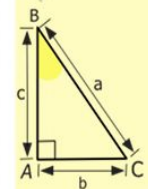
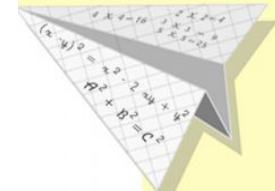
$$(x+y)(x-y) = x^2 - y^2$$

«Логарифмический дартс»



A large circular target divided into 24 segments, each containing a logarithmic expression. The segments are arranged in three concentric rings. The outermost ring contains 8 segments, the middle ring contains 8 segments, and the innermost ring contains 8 segments. The expressions are as follows:

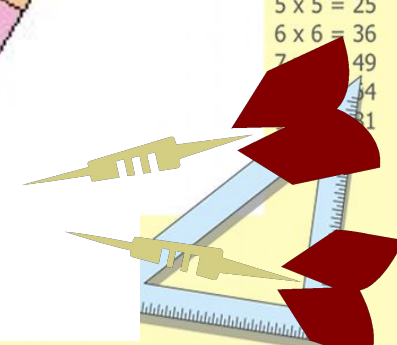
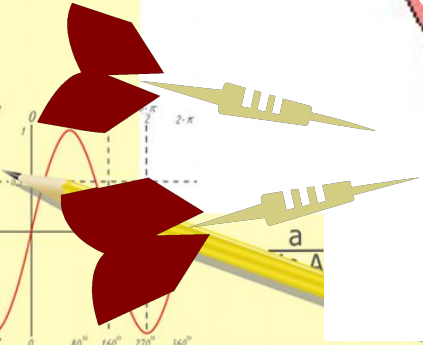
- Outermost ring (clockwise from top): $2^{-2\log_2 5}$, $\lg 8 + \lg 125$, $7^{\log_7 2} + 2$, $\log_{\sqrt{5}} 1$, $\log_{100} 10$, $\log_{\frac{1}{3}} \frac{1}{9}$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Middle ring (clockwise from top): $\log_2 2$, $\lg 0,01$, $\log_4 8$, $\log_2 8$, $\log_{27} 9$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\log_{\frac{1}{4}} 2$, $\log_{25} 125$, $\log_5 125$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg 100$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 8$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.
- Innermost ring (clockwise from top): $\lg 13 - \lg 130$, $\lg \frac{1}{1000}$, $\log_{16} 8$, $\log_2 32$, $\log_2 8$, $\log_2 8$, $\log_3 81$, $\log_8 16$, $\log_4 \frac{1}{8}$.



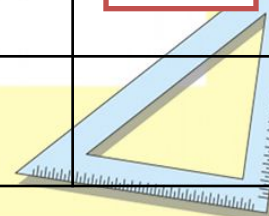
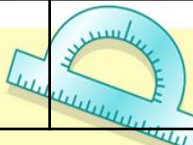
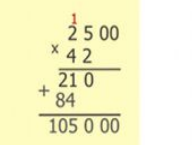
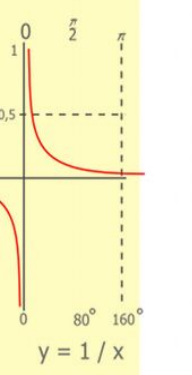
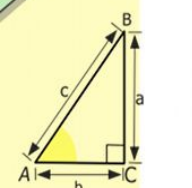
- $2 \times 2 = 4$
- $3 \times 3 = 9$
- $4 \times 4 = 16$
- $5 \times 5 = 25$
- $6 \times 6 = 36$
- $7 \times 7 = 49$
- $8 \times 8 = 64$
- $9 \times 9 = 81$



$$\begin{array}{r} 12500 \\ \times 42 \\ \hline 21000 \\ + 84000 \\ \hline 105000 \end{array}$$

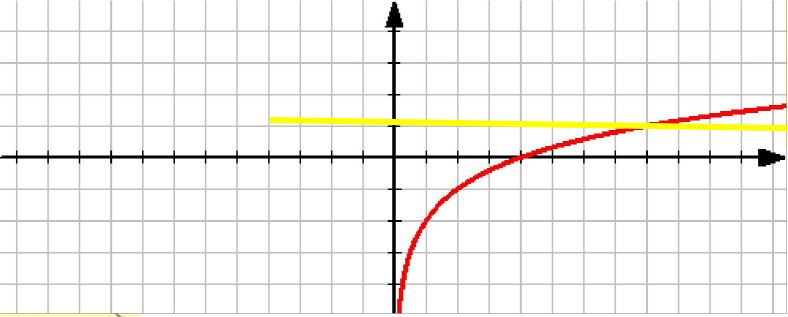


1	$\log_5 5^7$	-2	11	$\lg 1$	7
2	$\log_{11} x = 2$	4	12	$\log_x 7 = 1$	2
3	$\log_1 4$	4	13	$\log_2 16 = x$	4
4	$\log_5 x = -3$	0,1	14	$\log_7 7^4$	0
5	$\lg 1000$	7	15	$\log_{\frac{1}{5}} 3125$	4
6	$\log_2 x = 2$	121	16	$\log_x \frac{1}{343} = 3$	4
7	$\lg x = -1$	3	17	$\log_6 x = -2$	-5
8	$\log_x 4 = 1$	-4	18	$\log_7 49$	$\frac{1}{36}$
9	$\log_5 \frac{1}{625}$	0,04	19	$\log_x 256 = 4$	-5
10	$\log_{\frac{c}{a}} \frac{c}{b} x = 2$	$\frac{1}{125}$			

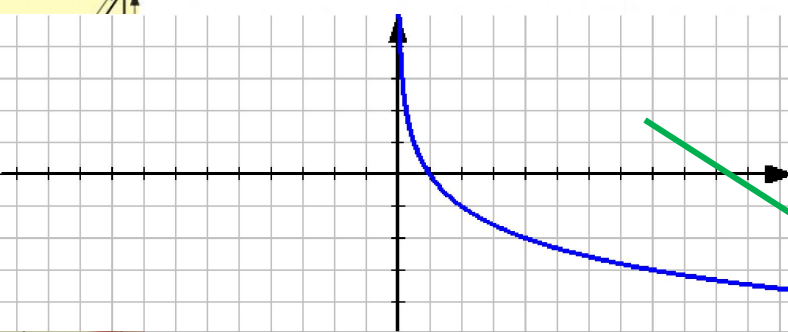


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases} \quad (x+y)(x-y) = x^2 - y^2$$

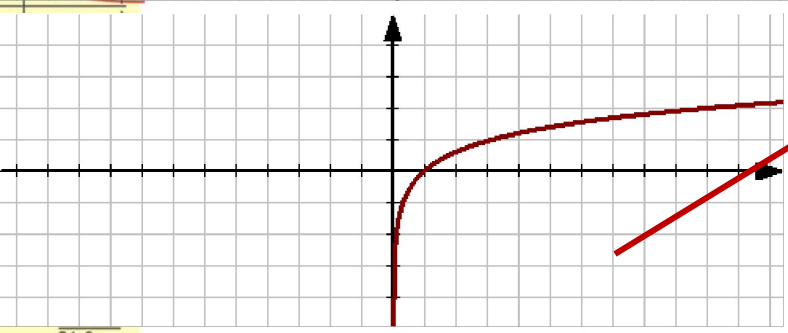
2 x 2 = 4
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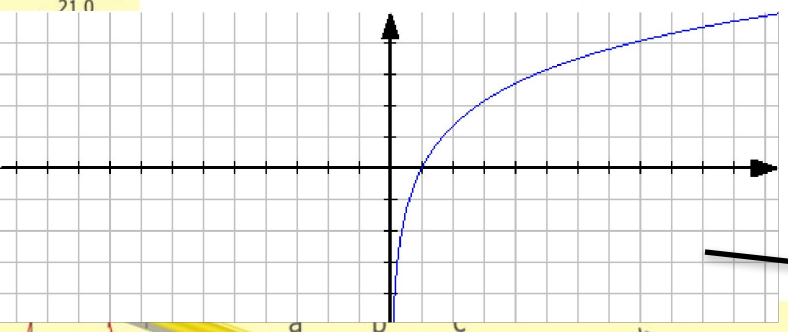
$$y = \log_2 x - 2$$



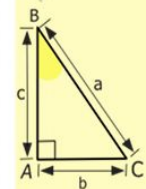
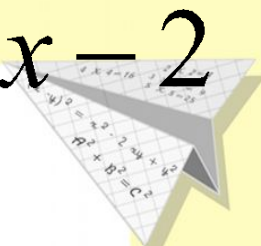
$$y = \lg x$$



$$y = \log_{\frac{1}{2}} x$$



$$y = -\log_{0.6} x$$



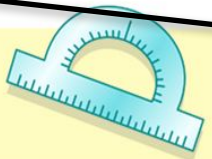
- 2 x 2 = 4
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$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

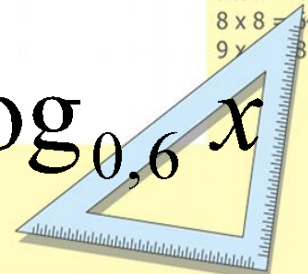


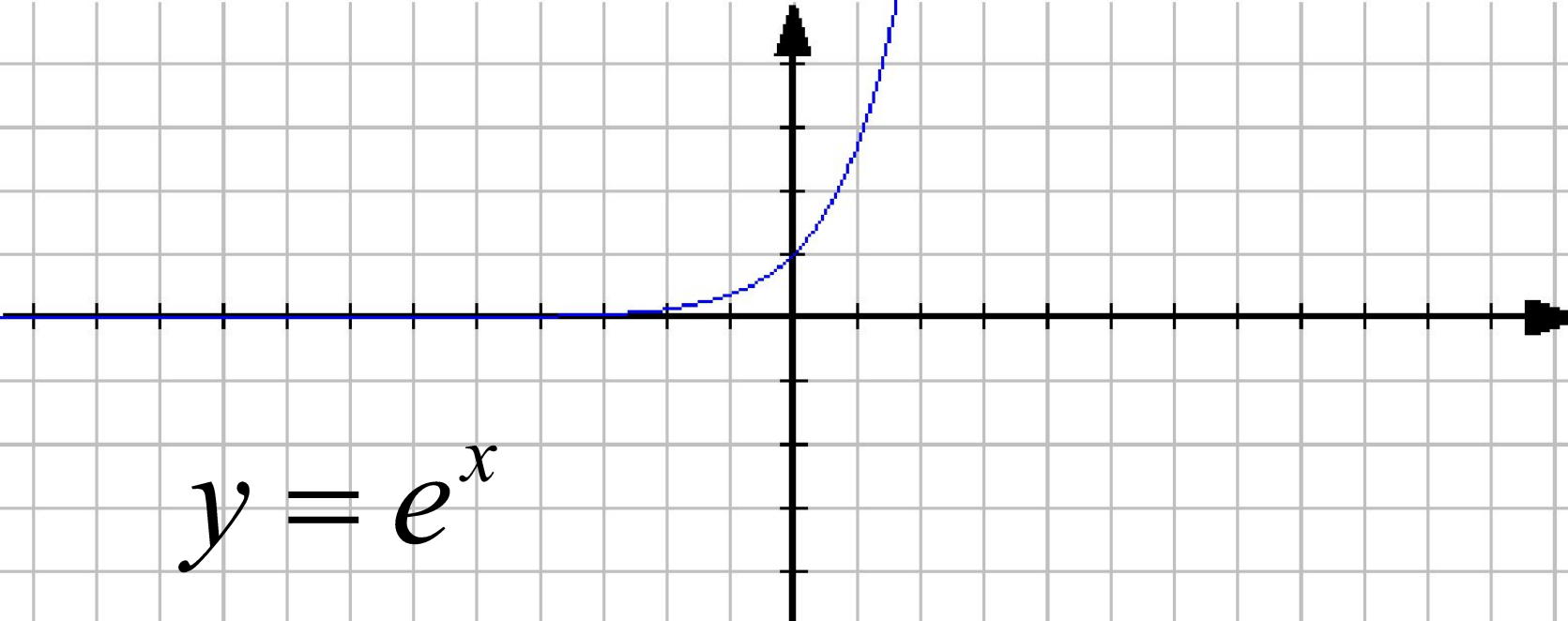
$$\begin{cases} y = \sin 90 \\ x = 25 + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$\frac{x}{70}$$

$$(x+y)(x-y) = x^2 - y^2$$




$$y = e^x$$

Не является ни четной, ни нечетной;

Возрастает;

Не ограничена сверху, ограничена снизу

Не имеет наименьшего, наибольшего значений;

непрерывна

Выпукла вниз

Дифференцируема

$$D(f) = (-\infty; +\infty)$$

$$E(f) = (-\infty; +\infty)$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

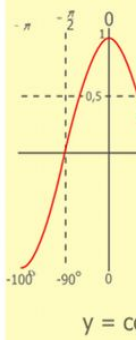
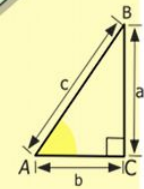
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$

- 2 x 2 = 4
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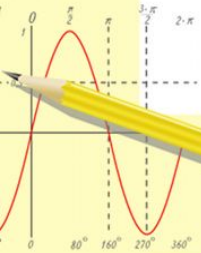


Функция	Производная
$y = 2e^x$	$y = 2e^x$
$y = e^{2x}$	$y = 2e^{2x}$
$y = e^x - x$	$y = e^x - 1$
$y = e^{3x} - x^2$	$y = 3e^{3x} - 2x$
$y = \left(\frac{1}{e}\right)^x$	$y = -e^x$



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
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$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

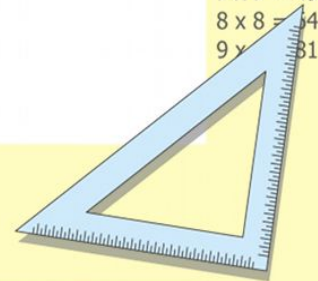
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



$$\int e^x dx = e^x + C$$

$$x^n$$

$$\frac{x^{n+1}}{n+1}$$

$$\cos x$$

$$-\sin x$$

$$\frac{1}{x^2}$$

$$\sin x$$

$$\cos x$$

$$y = f(kx + b)$$

$$y = \frac{1}{k} F(kx + b)$$

$$2\sqrt{x}; (x > 0)$$

$$-\operatorname{ctg} x$$

$$y = f(x) + g(x)$$

$$Y = F(x) + G(x)$$

$$\frac{1}{\sqrt{x}}$$

$$\operatorname{tg} x$$

$$y = kf(x)$$

$$Y = kF(x)$$

$$\frac{1}{\sin^2 x}$$

$$\frac{1}{\cos^2 x}$$

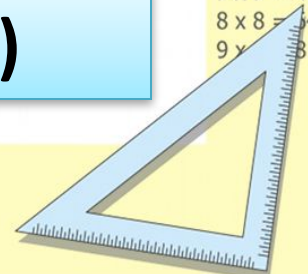
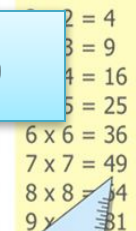
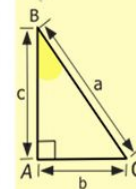
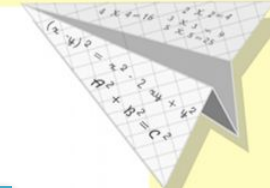
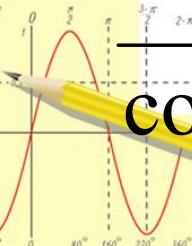
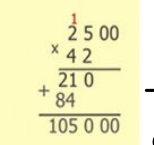
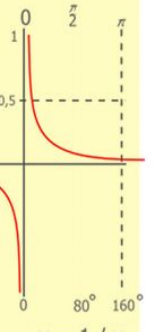
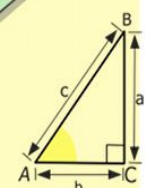
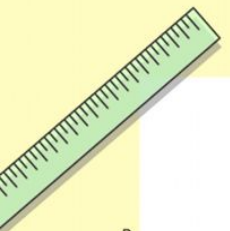
$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

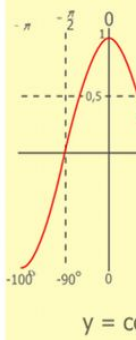
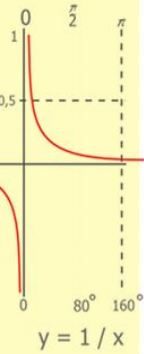
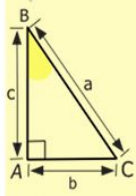
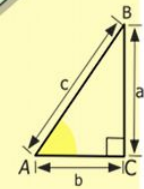
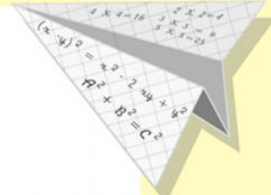
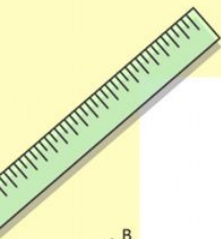
$$\begin{cases} \sin 90^\circ \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



$$\int_b^a f(x) dx = F(b) - F(a).$$

$$\int_b^a f(x) dx = F(x) \Big|_a^b$$



$\frac{1}{2} 500$
 $\times 42$
 \hline
 210
 $+ 84$
 \hline
 105000

- $2 \times 2 = 4$
- $3 \times 3 = 9$
- $4 \times 4 = 16$
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$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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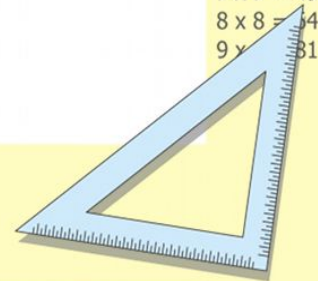
$\sin 90^\circ = 1$

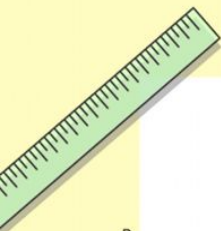


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

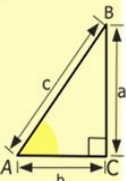
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$

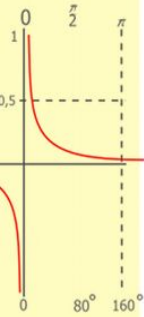



$$\int 3e^x dx$$


$$3e^x + C$$


$$\int e^{2x-3} dx$$

$$\frac{1}{2} e^{2x-3} + C$$


$$\int \frac{dx}{x^2}$$

$$-\frac{1}{x} + C$$


$$\int (e^x + \sin 2x) dx$$

$$e^x - \frac{1}{2} \cos 2x + C$$

$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

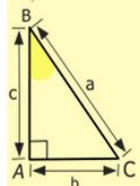
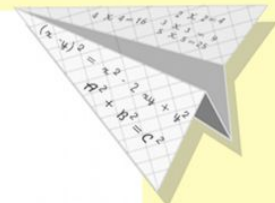


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

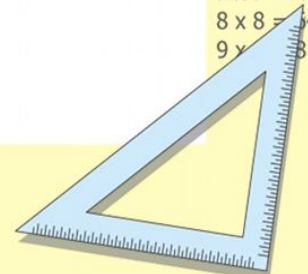
$$(x+y)(x-y) = x^2 - y^2$$

$$\frac{x}{70}$$



$$y = \cos$$

- $2 \times 2 = 4$
- $3 \times 3 = 9$
- $4 \times 4 = 16$
- $5 \times 5 = 25$
- $6 \times 6 = 36$
- $7 \times 7 = 49$
- $8 \times 8 = 64$
- $9 \times 9 = 81$

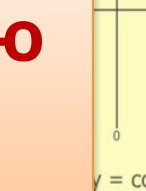
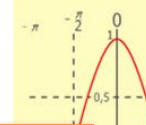
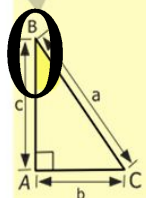
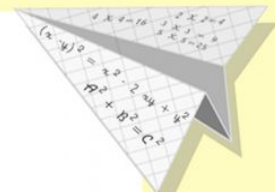


Десятичные логарифмы для наших потребностей являются весьма удобными. Однако при изучении высшей математики более удобными оказываются логарифмы по основанию $e = 2,718281828\dots$ (см. § 134, ч. 1). Употребление этих логарифмов позволяет значительно упростить большое количество математических формул. Логарифмы по основанию e получаются при решении многих физических задач и естественным образом входят в математическое описание некоторых химических, биологических и других процессов. Этим и объясняется их название «натуральные логарифмы».

Натуральный логарифм числа a обозначается $\ln a$. Сейчас имеются достаточно полные таблицы

$$\log_e b = \ln b, b > 0$$

Логарифм по основанию e называется натуральным логарифмом



3 x 3 =	9
4 x 4 =	16
5 x 5 =	25
6 x 6 =	36
7 x 7 =	49
8 x 8 =	64
9 x 9 =	81

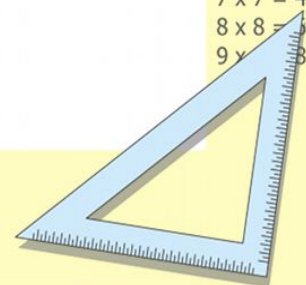


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



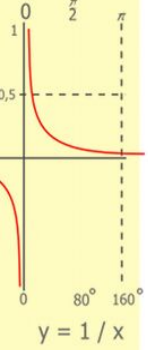
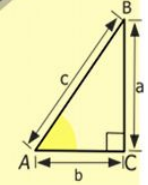
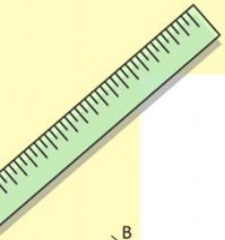
$$\ln 1 = 0$$

$$\ln e = 1$$

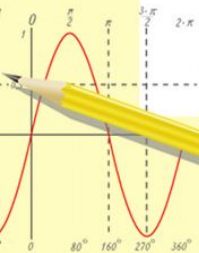
$$\ln e^r = r$$

$$e^{\ln x} = x$$

$$\log_a x = \frac{\ln x}{\ln a}$$



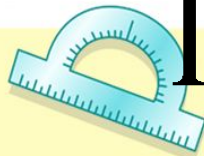
$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

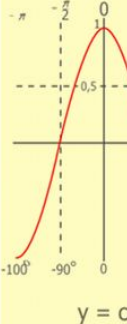
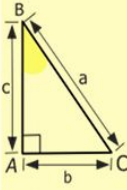
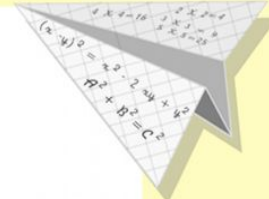
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25 + 45 \\ y = 1 \\ x = 25 + 45 \end{cases}$$

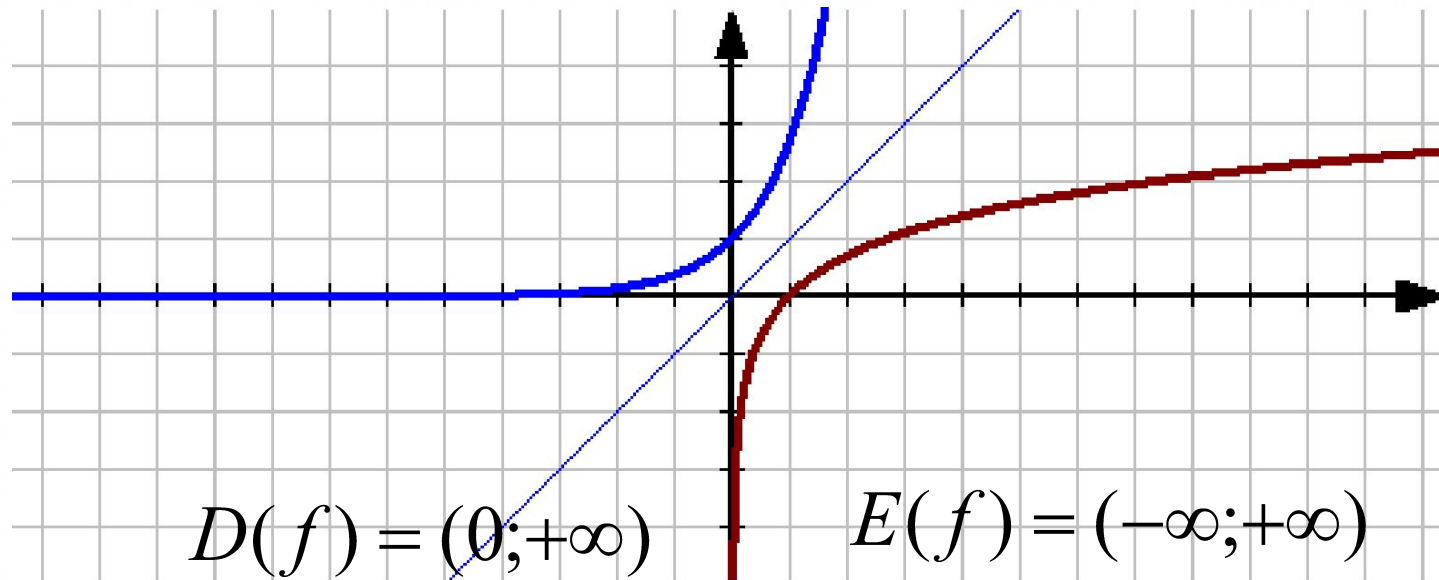
$$(x+y)(x-y) = x^2 - y^2$$



- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



Функция вида $y = \ln x$, свойства и график



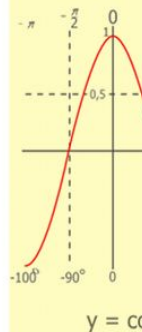
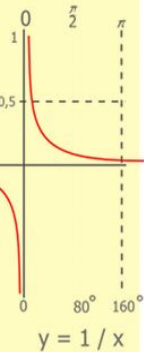
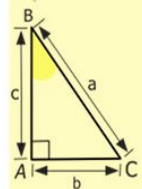
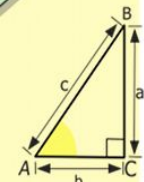
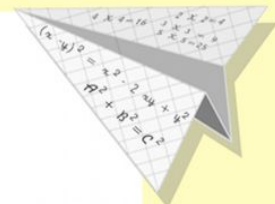
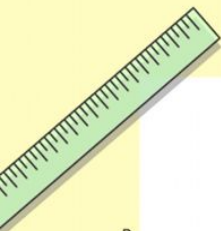
Ни четна, ни нечетна
Не ограничена ни сверху, ни снизу
Не имеет наибольшего, наименьшего значений
Непрерывна
Выпукла вверх
дифференцируема

- $2 \times 2 = 4$
- $3 \times 3 = 9$
- $4 \times 4 = 16$
- $5 \times 5 = 25$
- $6 \times 6 = 36$
- $7 \times 7 = 49$
- $8 \times 8 = 64$
- $9 \times 9 = 81$

$$(\ln x)' = \frac{1}{x}$$

$$\int \frac{dx}{x} = \ln|x| + C$$

$$(\log_a x)' = \frac{1}{x \ln a}$$



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

$2 \times 2 = 4$
 $3 \times 3 = 9$
 $4 \times 4 = 16$
 $5 \times 5 = 25$
 $6 \times 6 = 36$
 $7 \times 7 = 49$
 $8 \times 8 = 64$
 $9 \times 9 = 81$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

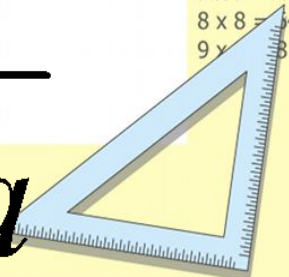
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

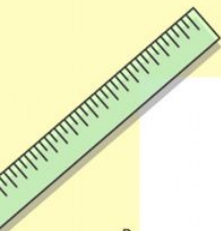
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

$$x(x-y) = x^2 - xy$$




$$y = \ln(3x + 5), x = -1$$

$$y' = (\ln(3x + 5))' = 3 \cdot \frac{1}{3x + 5} = \frac{3}{3x + 5}$$

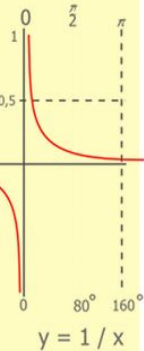
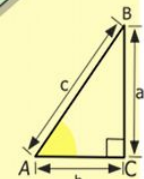
$$y'(-1) = \frac{3}{3(-1) + 5} = 1,5$$

$$y = \log_2 x$$

$$y' = \frac{1}{x \ln 2}$$

1633, 1634, 1635, 1636(a,б)

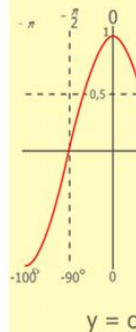
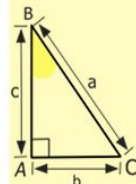
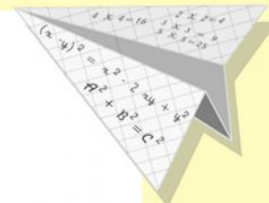
Дома: в,г



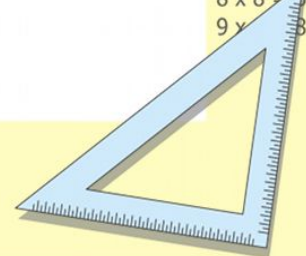
$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B}$$



$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



№1633

$$y = x^2 \ln x$$

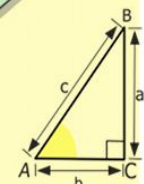
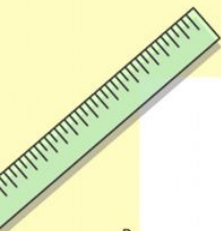
$$y' = (x^2)' \ln x + x^2 (\ln x)'$$

$$y' = 2x \ln x + x^2 \cdot \frac{1}{x} = 2x \ln x + x$$

$$y = \frac{\ln x}{x+1}$$

$$y'' = \frac{(\ln x)'(x+1) - \ln x(x+1)'}{(x+1)^2} =$$

$$\frac{\frac{1}{x} \cdot (x+1) - \ln x}{(x+1)^2} = \frac{x+1 - x \ln x}{x(x+1)^2}$$



$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

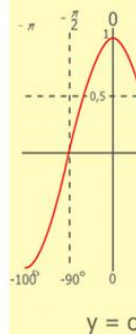
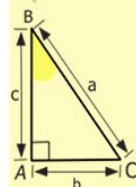
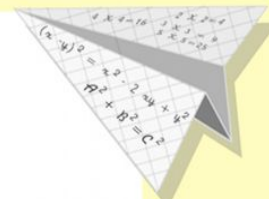
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

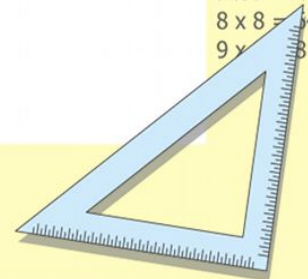


$$\begin{cases} = \sin 90 \\ x = 2y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



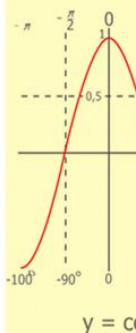
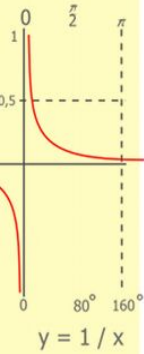
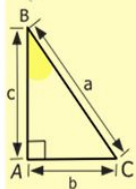
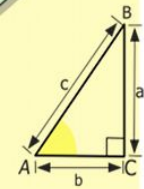
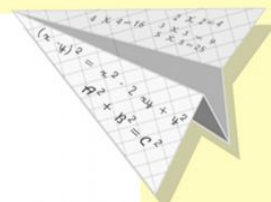
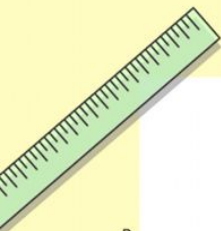
№1634

$$y = e^x \ln x$$

$$y' = e^x \ln x + \frac{e^x}{x}$$

$$y = 3 \ln x + \sin 2x$$

$$y' = \frac{3}{x} + 2 \cos 2x$$



$\frac{1}{2} 5 00$
 $\times 4 2$
 $\hline 21 0$
 $+ 84$
 $\hline 105 0 00$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

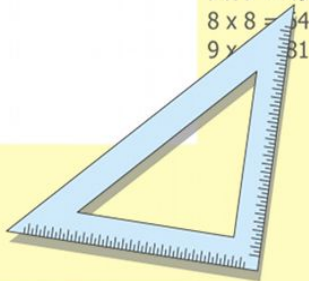
$\sin 90^\circ = 1$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



№1635

$$y = \ln x + x, x_0 = \frac{1}{7}$$

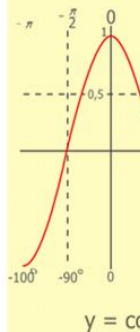
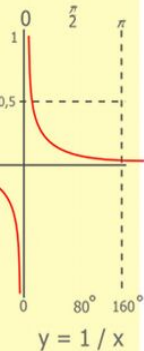
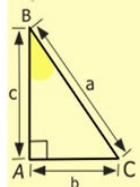
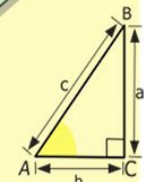
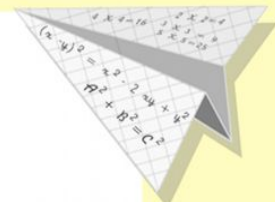
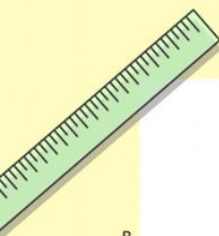
$$y' = \frac{1}{x} + 1$$

$$y' = 8$$

$$y = x^3 \ln x, x_0 = e$$

$$y' = 3x^2 \ln x + x^2$$

$$y' = 3e^2 + e^2 = 4e^2$$



$\frac{1}{2} 5 00$
 $\times 4 2$
 $\hline 21 0$
 $+ 84$
 $\hline 105 0 00$

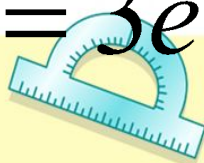
$2 \times 2 = 4$
 $3 \times 3 = 9$
 $4 \times 4 = 16$
 $5 \times 5 = 25$
 $6 \times 6 = 36$
 $7 \times 7 = 49$
 $8 \times 8 = 64$
 $9 \times 9 = 81$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$\sin 90^\circ = 1$

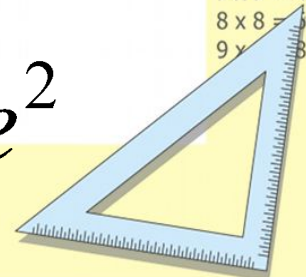


$$\begin{cases} y = \sin 90 \\ x = 25 + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



№1636

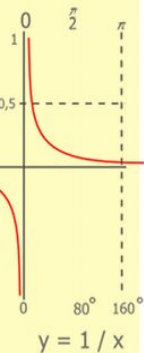
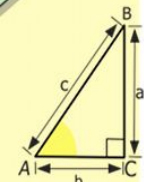
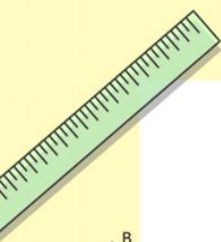
$$y = \ln(2x + 2), x_0 = -\frac{1}{4}$$

$$y' = \frac{2}{2x + 2} = \frac{1}{x + 1}$$

$$y' = \frac{1}{1 - \frac{1}{4}} = \frac{4}{3} = 1\frac{1}{3}$$

$$y = \ln(5 - 2x), x_0 = 2$$

$$y' = -\frac{2}{5 - 2x} = -\frac{2}{1} = -2$$



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

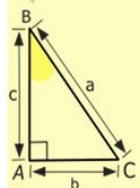
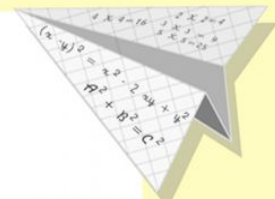
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

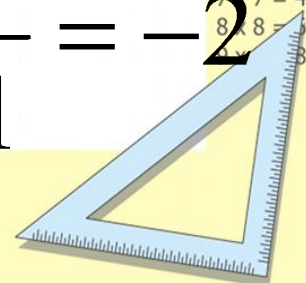


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



$2 \times 2 = 4$
 $3 \times 3 = 9$
 $4 \times 4 = 16$
 $5 \times 5 = 25$
 $6 \times 6 = 36$
 $7 \times 7 = 49$
 $8 \times 8 = 64$
 $9 \times 9 = 81$



Составить уравнение касательной к графику функции $y = \ln x$ в точке $x = e$

$$y = f'(x_0)(x - x_0) + f(x_0)$$

$$f(x_0) = \ln e = 1$$

$$f'(x) = \frac{1}{x}$$

$$f'(x_0) = \frac{1}{e}$$

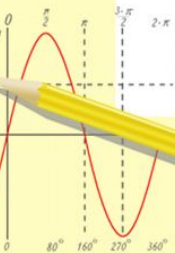
$$y = \frac{1}{e}(x - e) + 1 = \frac{x}{e} - 1 + 1 = \frac{x}{e}$$

№1623,1637,16

41 (а,б)

В,Г - дома

$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

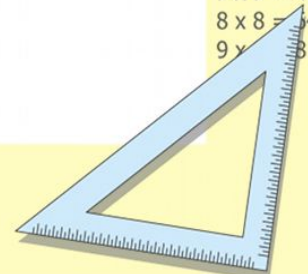


$$\begin{cases} y = \sin 90 \\ x = 25 + 45 \end{cases}$$

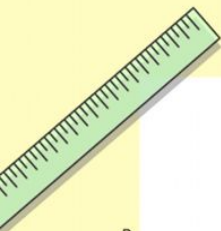
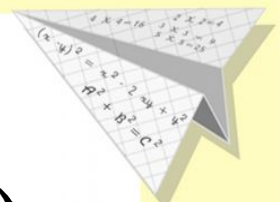
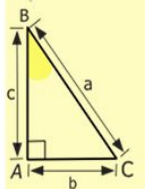
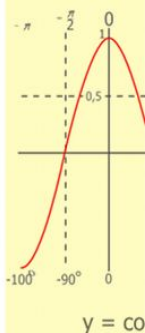
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\int_1^2 \frac{dx}{x} = \ln|x| \Big|_1^2 = \ln 2 - \ln 1 = \ln 2$$

$$\int_1^2 \left(e^x + \frac{1}{x} \right) dx = \left(e^x + \ln|x| \right) \Big|_1^2 = e^2 - e + \ln 2 - \ln 1 = e^2 - e + \ln 2$$

$$\int_{-1}^0 \frac{dx}{-5x+6} = -\frac{1}{5} \ln|-5x+6| \Big|_{-1}^0 =$$

$$-\frac{1}{5} (\ln 6 - \ln 11) = -\frac{1}{5} \ln \frac{6}{11}$$

$$\int_3^6 \frac{dx}{2x-3} = \frac{1}{2} \ln|2x-3| \Big|_3^6 = \frac{1}{2} (\ln 9 - \ln 3) =$$

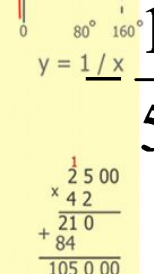
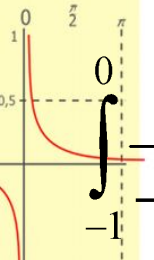
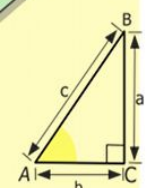
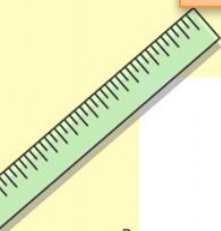
$$\frac{1}{2} \ln \frac{9}{3} = \frac{1}{2} \ln 3$$

$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

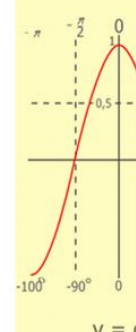
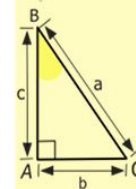
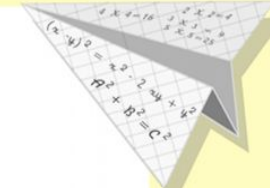
$$(x+y)(x-y) = x^2 - y^2$$

$$\frac{x}{70}$$

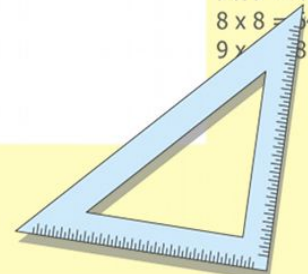


$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$



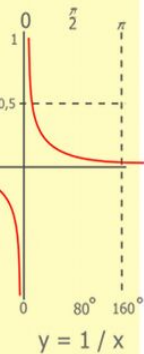
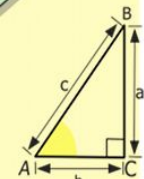
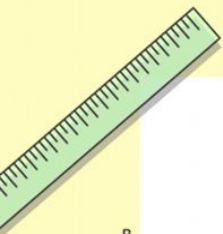
- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



Вычислить площадь фигуры, ограниченной прямыми $y=0$, $x=1$, $x=e$ и гиперболой $y = \frac{1}{x}$



$$S = \int_1^e \frac{dx}{x} = \ln x \Big|_1^e = \ln e - \ln 1 = 1$$



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

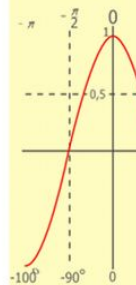
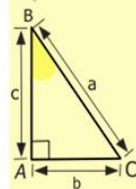
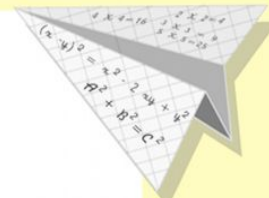
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

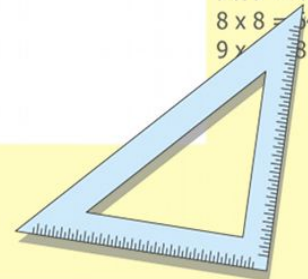
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



$$y = \cos$$

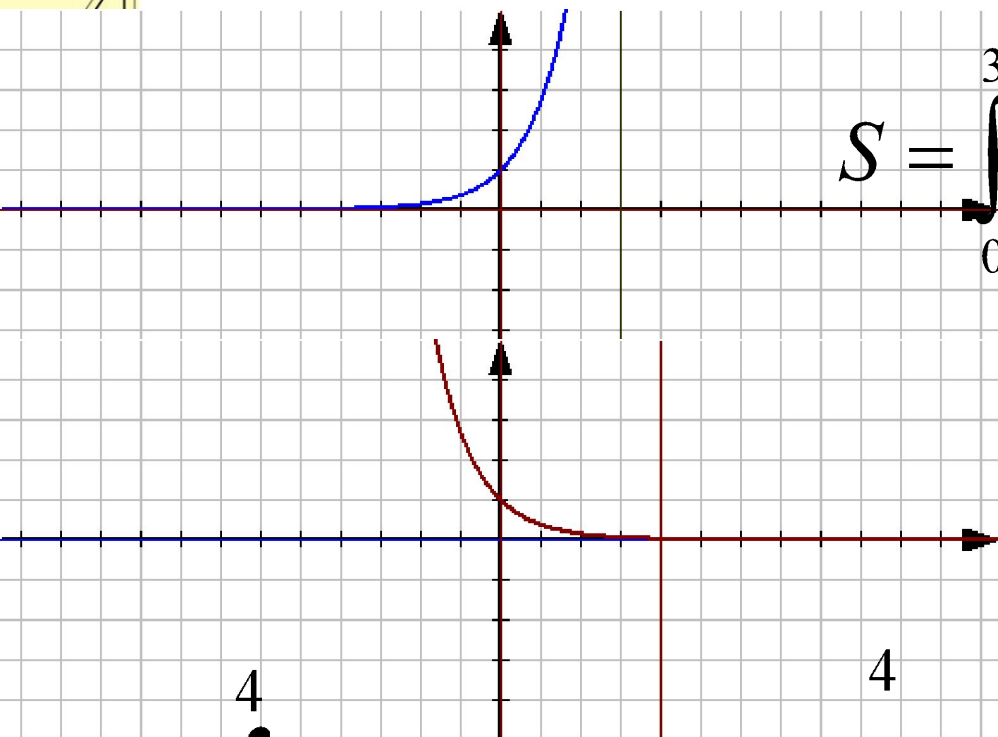
$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



№1628, 1629, 1642, 1645 (а,б) дома: в,г

$$y = 0, x = 0, x = 3, y = e^x$$

$$S = \int_0^3 e^x dx = e^x \Big|_0^3 = e^3 - 1$$



$$S = \int_0^4 e^{-x} dx = -e^{-x} \Big|_0^4 = -e^{-4} - (-e^0) = 1 - \frac{1}{e^4}$$



- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

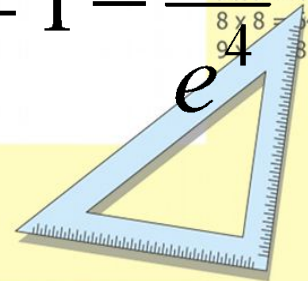
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

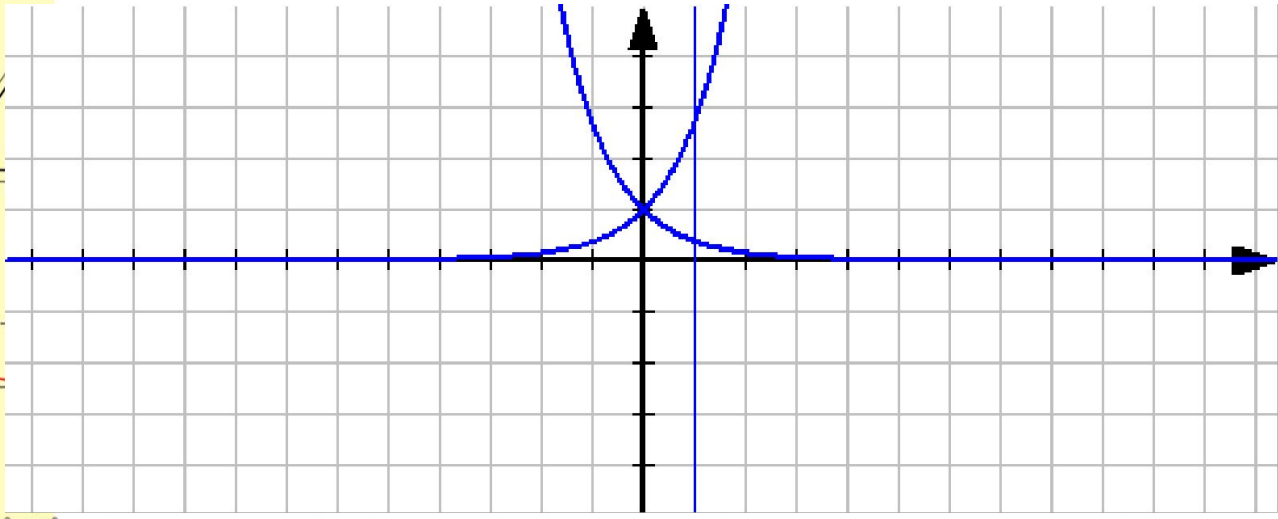
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



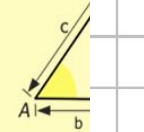
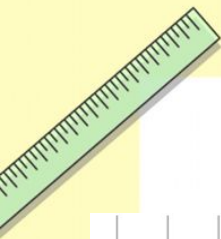
№1629 (a)

$$x = 1, y = e^x, y = e^{-x}$$

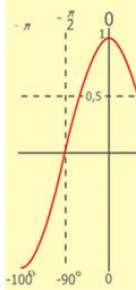
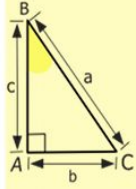


$$S = \int_0^1 e^x dx - \int_0^1 e^{-x} dx = e^x \Big|_0^1 - (-e^{-x}) \Big|_0^1 =$$

$$e - 1 + e^{-1} - 1 = e - 2 + \frac{1}{e} = \frac{e^2 - 2e + 1}{e} = \frac{(e-1)^2}{e}$$

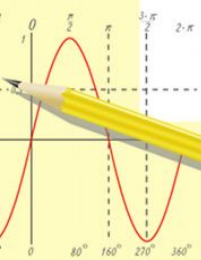


$\frac{1}{2} \times 42 = 21$
 $\frac{21}{84} = \frac{1}{4}$
 $\frac{1}{4} \times 105 = 26.25$



y = cos

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

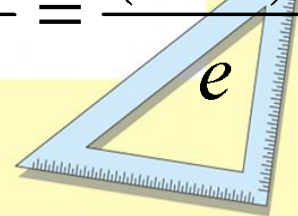
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

sin 90° = 1



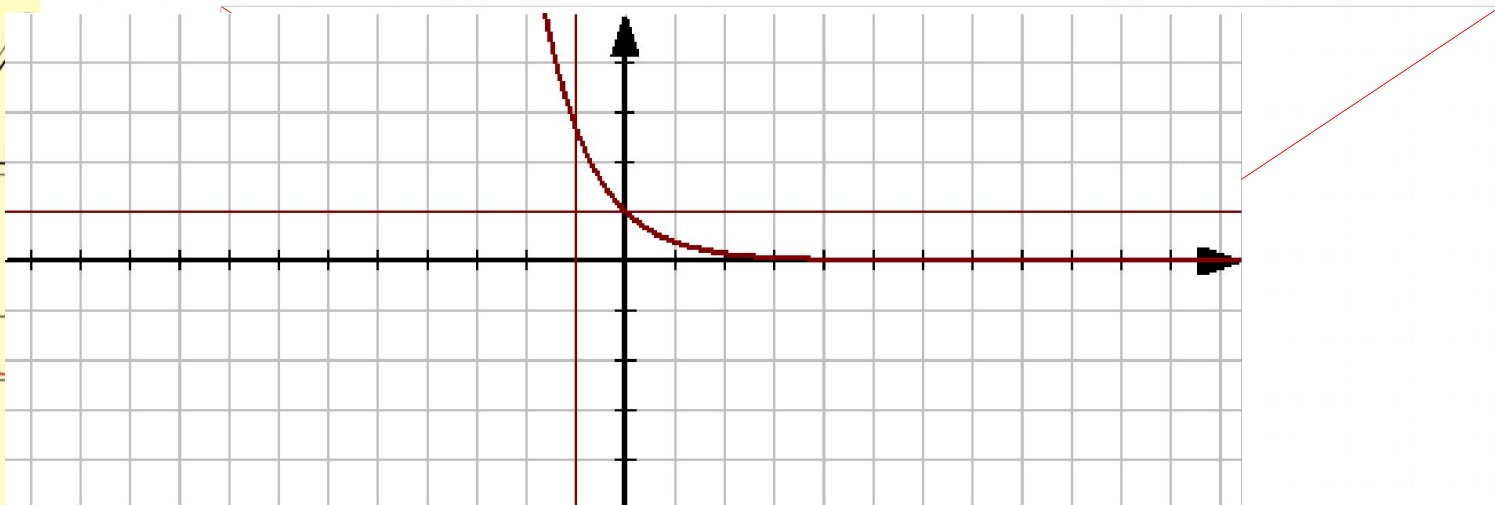
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



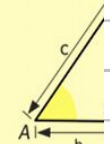
№1629(6)

$$y = \frac{1}{e^x}, y = 1, x = -1$$



$$S = \int_{-1}^0 e^{-x} dx - S_{KB} = -e^{-x} \Big|_{-1}^0 - 1 =$$

$$-1 + e - 1 = e - 2$$



$$\begin{array}{r} 1 \\ \times 2500 \\ 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

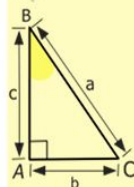
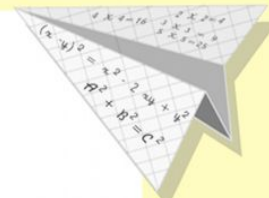
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

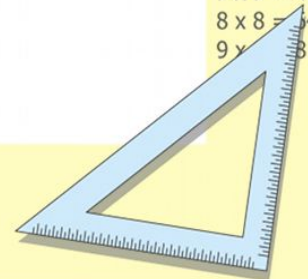
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



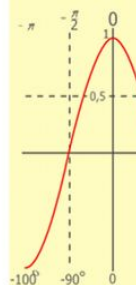
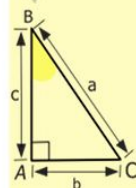
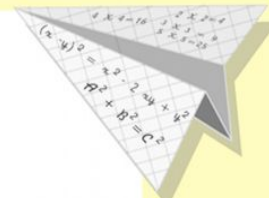
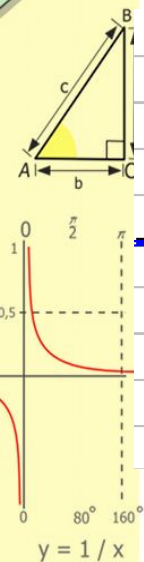
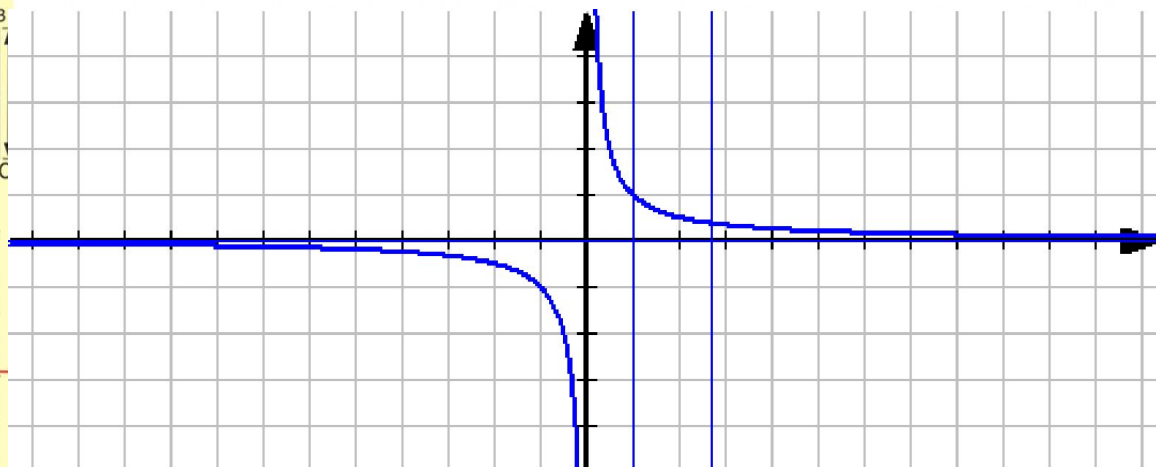
y = cos

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



№1642

$$y = 0, x = 1, x = e, y = \frac{1}{x}$$



$$S = \int_1^e \frac{dx}{x} = \ln x \Big|_1^e = \ln e - \ln 1 = 1$$

$$\begin{array}{r} 1\ 5\ 00 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105\ 000 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

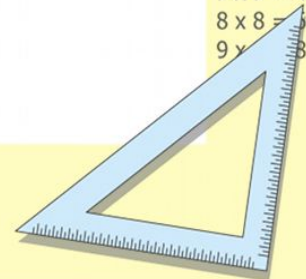
$\sin 90^\circ = 1$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

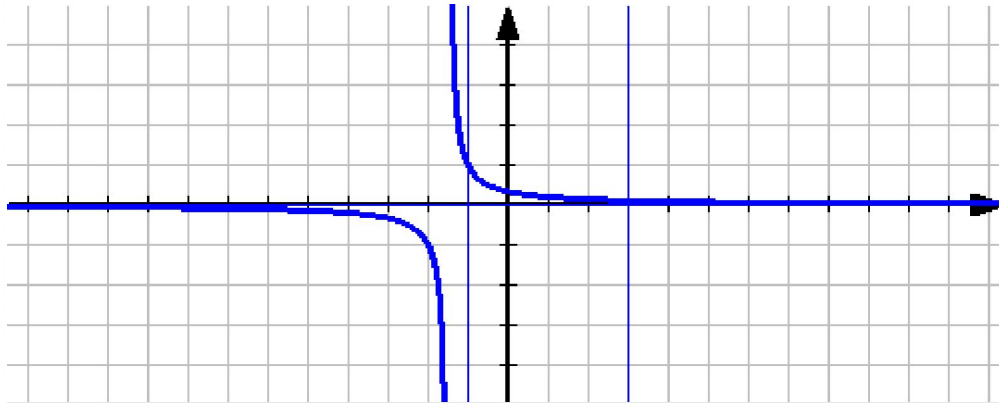
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



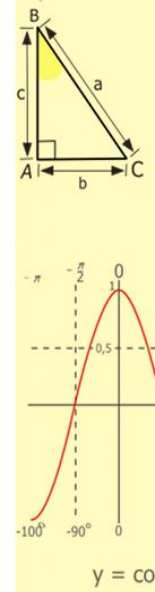
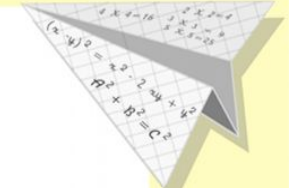
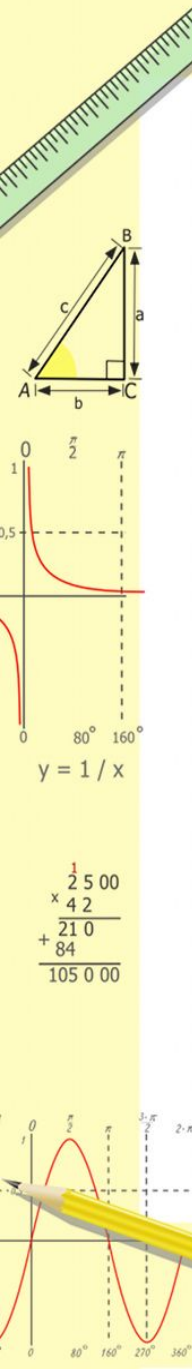
№1642(б)

$$y = 0, x = 3, x = -1, y = \frac{1}{2x+3}$$



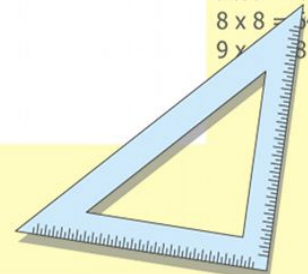
$$S = \int_{-1}^3 \frac{dx}{2x+3} = \frac{1}{2} \ln(2x+3) \Big|_{-1}^3 = \frac{1}{2} (\ln 9 - \ln 1) =$$

$$\frac{1}{2} \ln 9 = \frac{1}{2} \ln 3^2 = \frac{1}{2} \cdot 2 \ln 3 = \ln 3$$



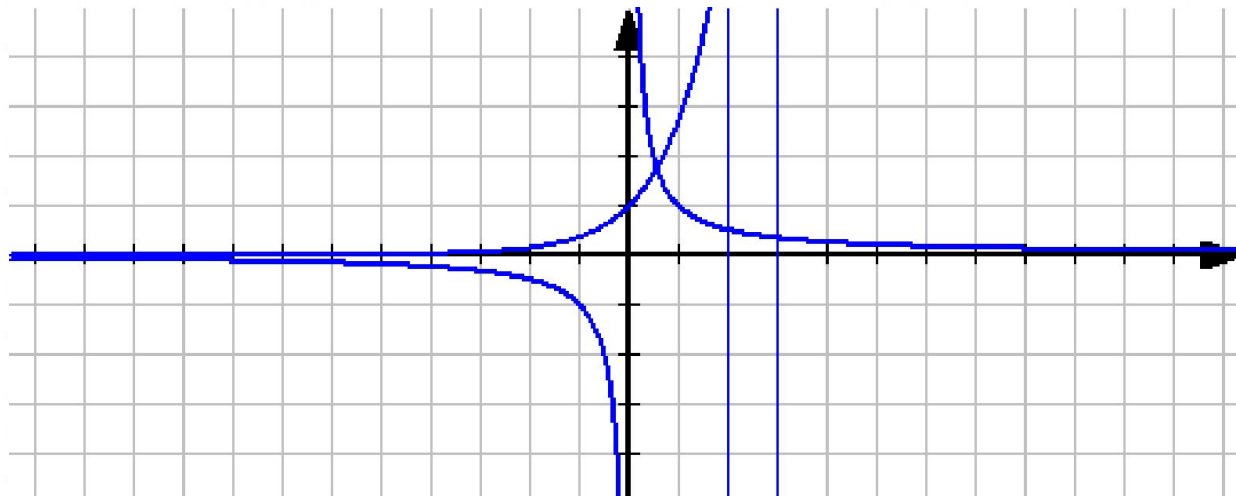
- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81

$\sin 90^\circ = 1$
 $x = 25y + 45$
 $y = 1$
 $x = 25 + 45$
 $x = 70$
 $(x+y)(x-y) = x^2 - y^2$



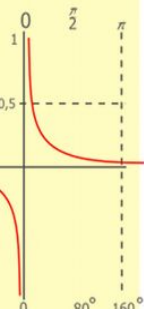
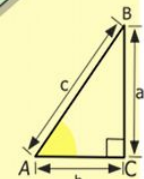
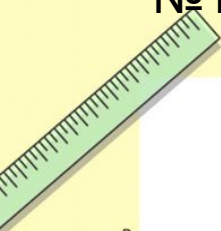
№1645 (a)

$$y = e^x, y = \frac{1}{x}, x = 2, x = 3$$



$$S = \int_2^3 e^x dx - \int_2^3 \frac{dx}{x} = e^x \Big|_2^3 - \ln x \Big|_2^3 =$$

$$e^3 - e^2 - \ln 3 + \ln 2 = e^3 - e^2 + \ln \frac{2}{3}$$



$y = 1/x$

$$\begin{array}{r} 1 \\ \times 2500 \\ \hline 2500 \\ + 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

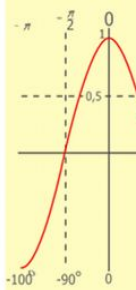
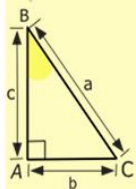
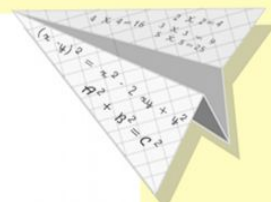
$\sin 90^\circ = 1$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

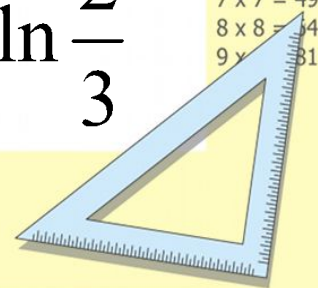
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



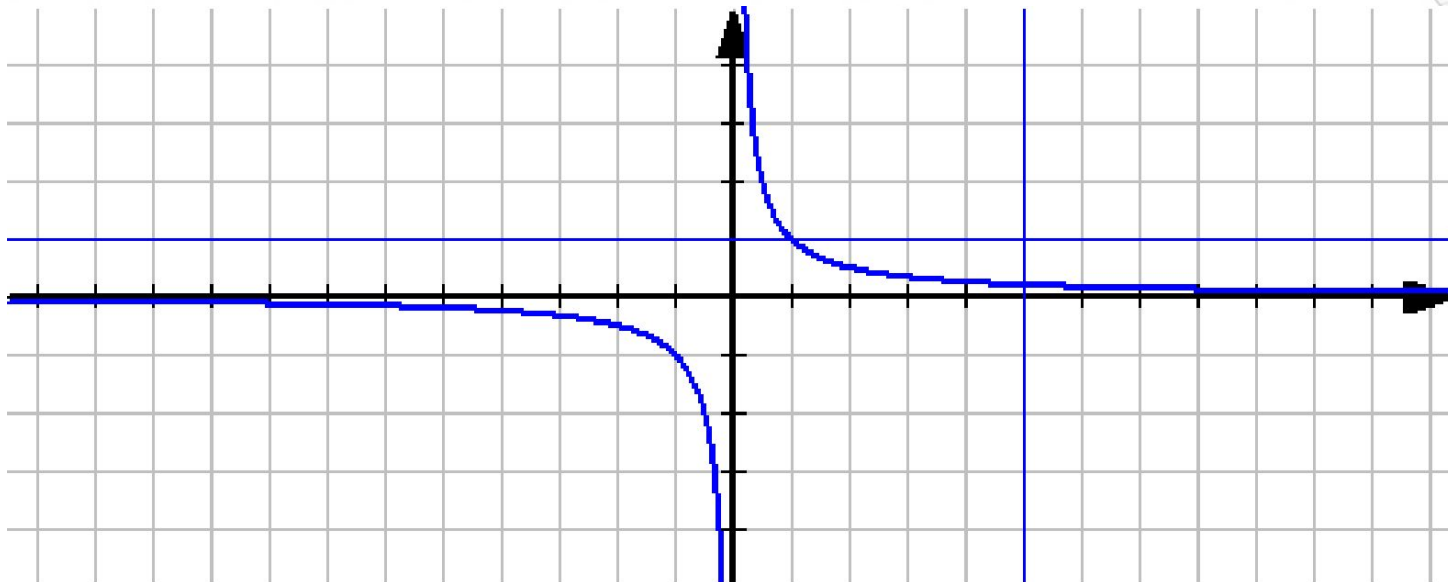
$y = \cos$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



№1645(6)

$$y = \frac{1}{x}, y = 1, x = 5$$



$$S = 1 \cdot 5 - \int_1^5 \frac{dx}{x} = 5 - \ln 5$$

$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

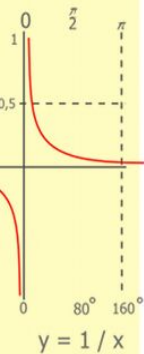
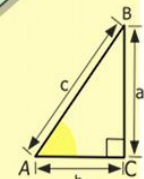
$$\sin 90^\circ = 1$$

$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

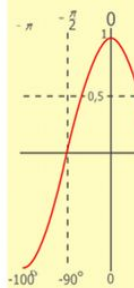
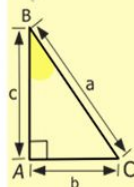
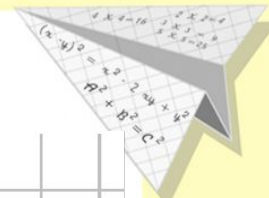
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 2100 \\ + 840 \\ \hline 105000 \end{array}$$



y = cos

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81

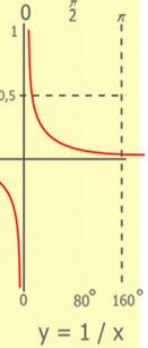
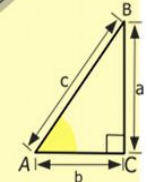
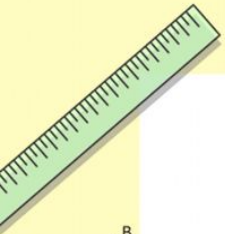


Задание на каникулы:

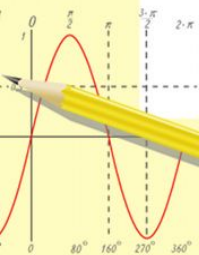
Создать справочник по формулам (лучше напечатать, чтобы можно было размножить), презентация, видеоролик и т.п.

1. Тригонометрические формулы
2. Тригонометрические уравнения (общий вид, частные случаи, методы решения)
3. Производная
4. Применение производной к исследованию функций
5. Функции, свойства, графики, преобразования
6. Первообразная и интеграл
7. Показательные уравнения и неравенства
8. Логарифмические уравнения и неравенства
9. Степени и корни
10. Системы уравнений
11. Основные типы задач

12. РЕШАТЬ ВАРИАНТЫ ЕГЭ



$$\begin{array}{r} \frac{1}{2} 5 00 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105 000 \end{array}$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{a}{c} = \frac{a}{c} + \frac{a}{c}$$

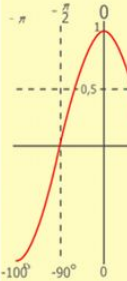
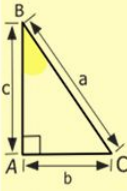
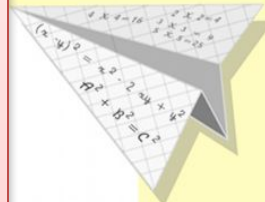
$$x = 25\sqrt{+45}$$

$$y = \dots$$

$$x = 25 + 45$$

$$x = 70$$

$$(x-4)(x-4) = x^2 - 4^2$$



$$y = \cos$$

$$2 \times 2 = 4$$

$$3 \times 3 = 9$$

$$4 \times 4 = 16$$

$$5 \times 5 = 25$$

$$6 \times 6 = 36$$

$$7 \times 7 = 49$$

$$8 \times 8 = 64$$

$$9 \times 9 = 81$$

