

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

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

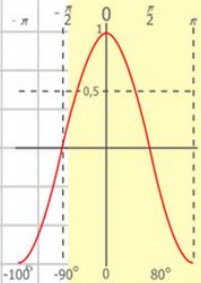
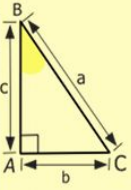
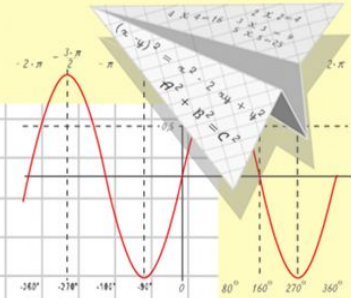
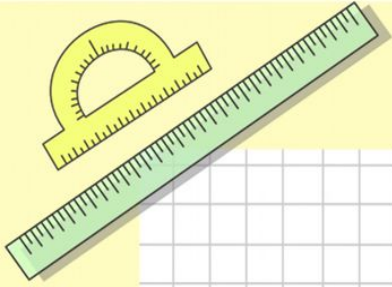
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

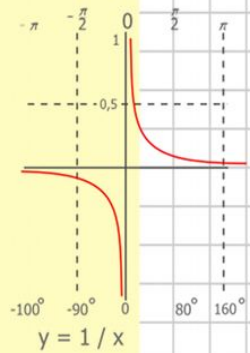
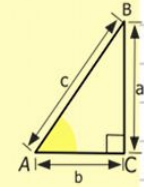
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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

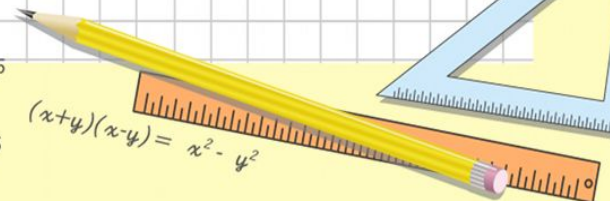
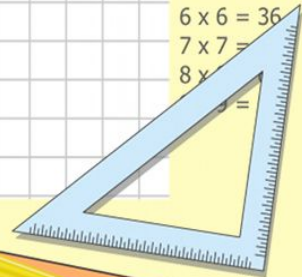
$$\begin{aligned} 2 \times 2 &= 4 \\ 3 \times 3 &= 9 \\ 4 \times 4 &= 16 \\ 5 \times 5 &= 25 \\ 6 \times 6 &= 36 \\ 7 \times 7 &= 49 \\ 8 \times 8 &= 64 \end{aligned}$$

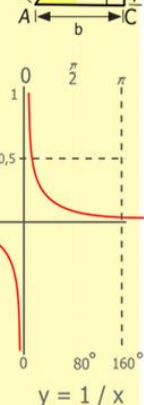


$$y = \cos x$$

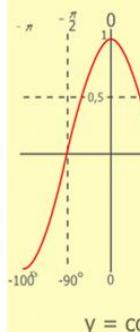
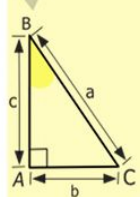
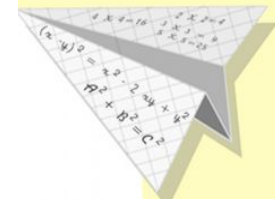
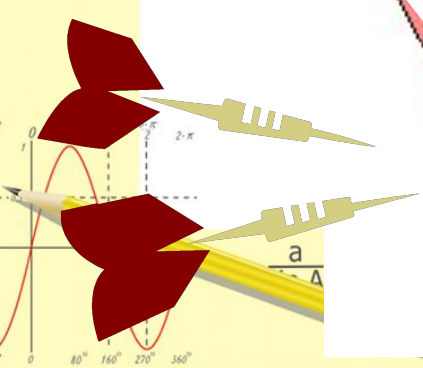


$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

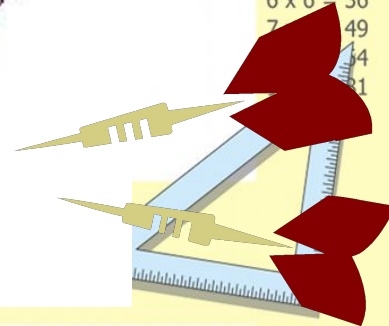




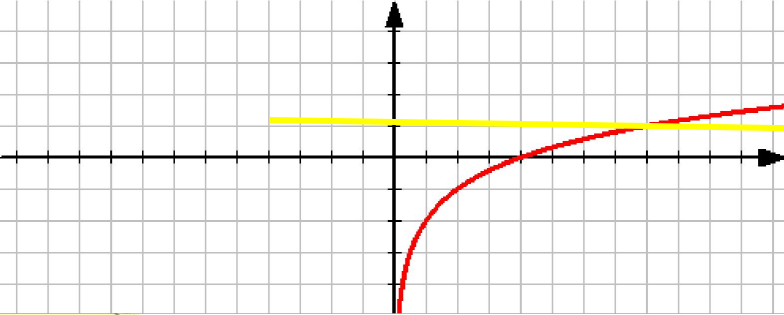
$$\begin{array}{r} \overset{1}{2}500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



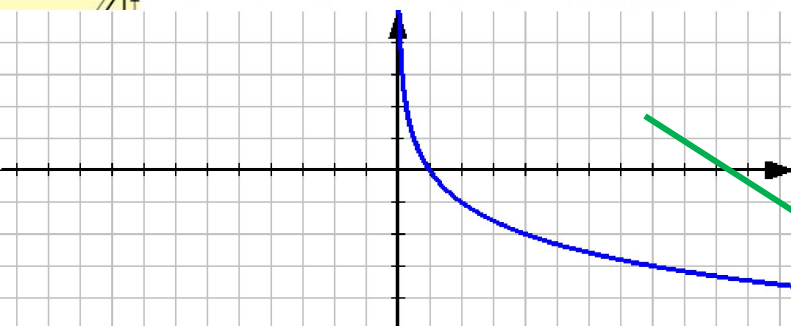
$2 \times 2 = 4$
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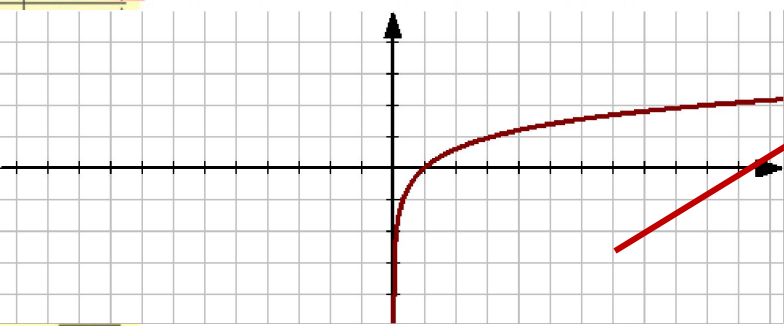
1	$\log_5 5^7$	-2	11	$\lg 1$	7
2	$\log_{11} x = 2$	4	12	$\log_x 7 = 1$	2
3	$\log_1 4$	4	13	$\log_2 16 = x$	4
4	$\log_5 x = -3$	0,1	14	$\log_7 7^4$	0
5	$\lg 1000$	7	15	$\log_{\frac{1}{5}} 3125$	4
6	$\log_2 x = 2$	121	16	$\log_x \frac{1}{343} = 3$	4
7	$\lg x = -1$	3	17	$\log_6 x = -2$	-5
8	$\log_x 4 = 1$	-4	18	$\log_7 49$	$\frac{1}{36}$
9	$\log_5 \frac{1}{625}$	0,04	19	$\log_x 256 = 4$	-5
10	$\log_{0.2} x = 2$	$\frac{1}{125}$		$y = \sin 90^\circ$ $x = 25y + 45$ $y = 1$ $x = 25 + 45$ $(x+y)(x-y) = x^2 - y^2$ $x = 70$	



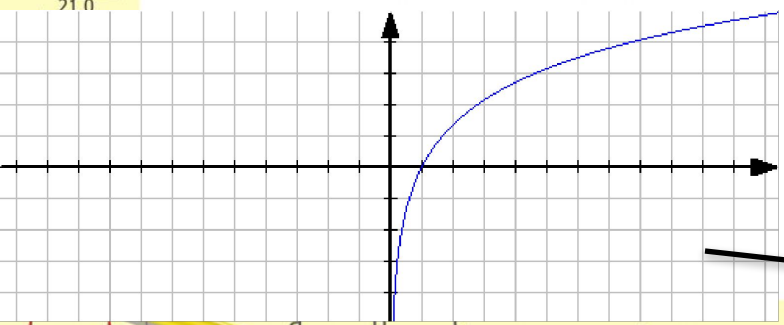
$$y = \log_2 x - 2$$



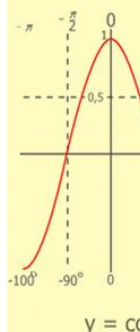
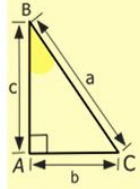
$$y = \lg x$$



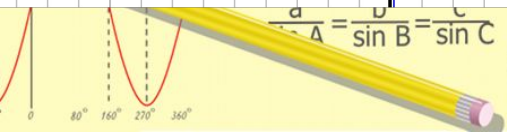
$$y = \log_{\frac{1}{2}} x$$



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

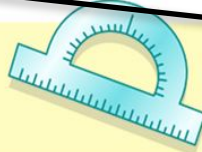


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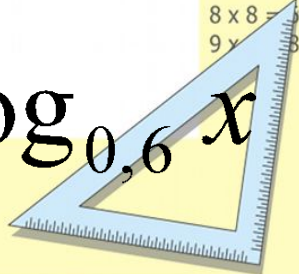
$$\frac{a}{c} = \frac{b}{c} = \frac{a+b}{c}$$

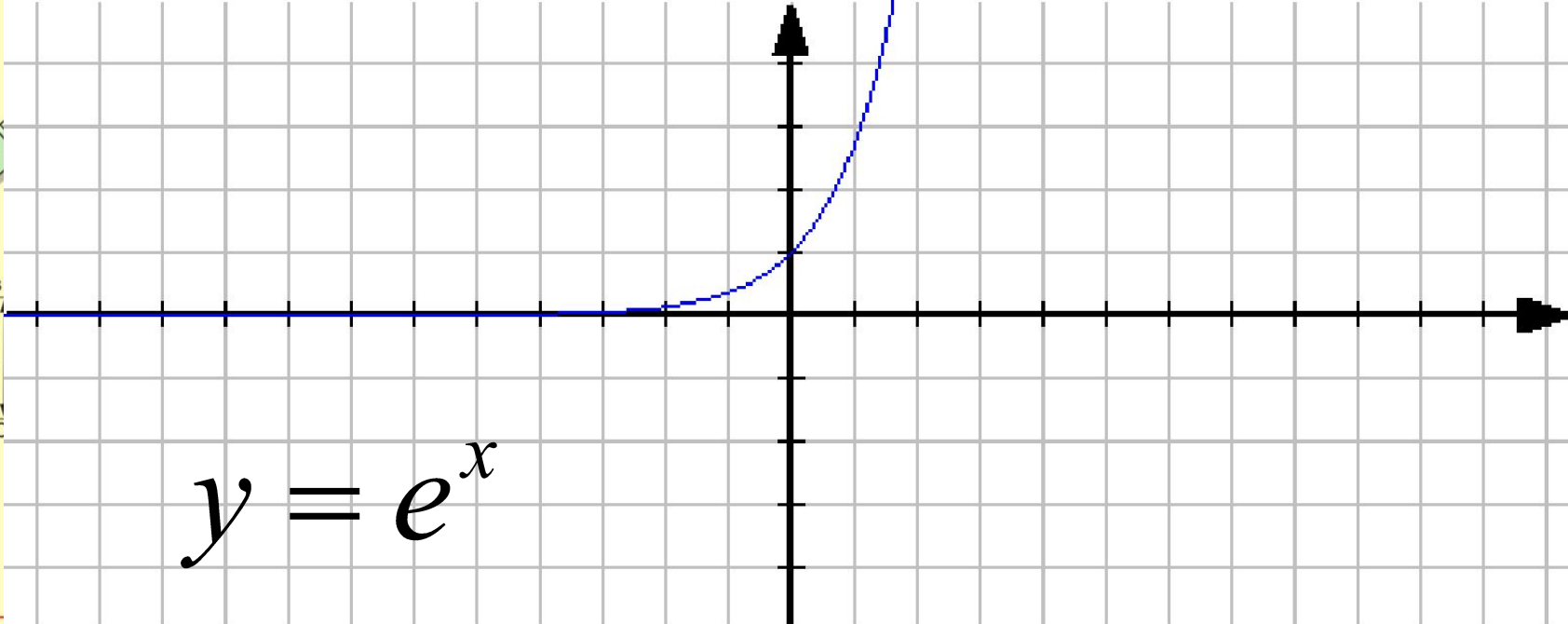
$$\sin 90^\circ = 1$$



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

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





$$y = e^x$$

Не является ни четной, ни нечетной; $D(f) = (-\infty; +\infty)$

Возрастает;

Не ограничена сверху, ограничена снизу

Не имеет наименьшего, наибольшего значений;
непрерывна

Выпукла вниз

Дифференцируема

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

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

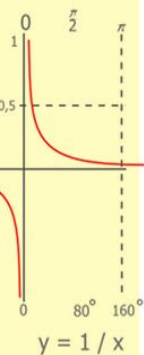
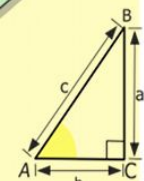
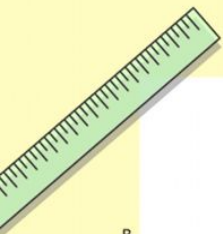
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

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

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

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



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



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

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

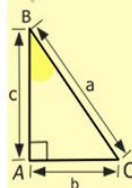


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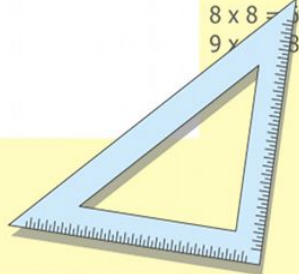
$$(x+y)(x-y) = x^2 - y^2$$

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



$$y = \cos$$

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



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

$$x^n$$

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

$$\cos x$$

$$-\sin x$$

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

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

$$\sin x$$

$$\cos x$$

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

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

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

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

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

$$-\operatorname{ctg} x$$

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

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

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

$$\operatorname{tg} x$$

$$y = kf(x)$$

$$Y = kF(x)$$

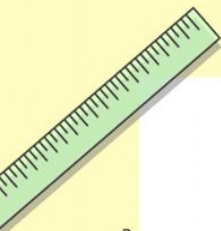
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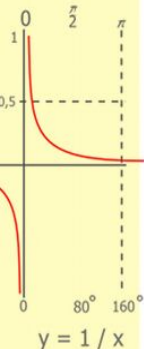
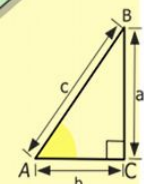
$$\begin{cases} \sin 90^\circ \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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



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

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



$$\begin{array}{r} 1\ 2\ 5\ 00 \\ \times 4\ 2 \\ \hline 21\ 0 \\ + 84 \\ \hline 105\ 0\ 00 \end{array}$$



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

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

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

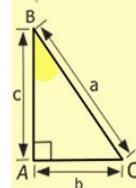
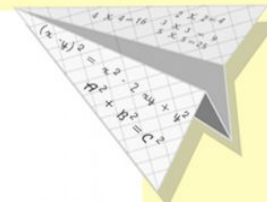


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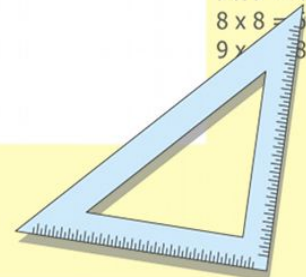
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$$\int 3e^x dx$$

$$3e^x + C$$

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

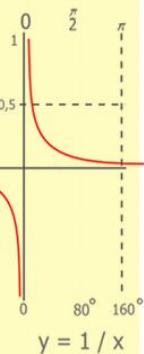
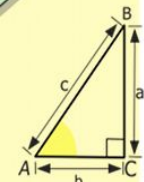
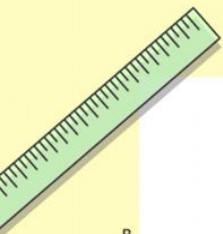
$$\frac{1}{2}e^{2x-3} + C$$

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

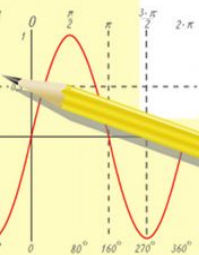
$$-\frac{1}{x} + C$$

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

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



$$\begin{array}{r} 1 \\ \times 2500 \\ \hline 2500 \\ + 210 \\ \hline 2710 \\ + 84 \\ \hline 2794 \end{array}$$



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

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

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

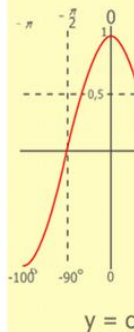
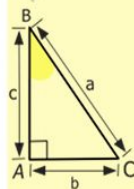
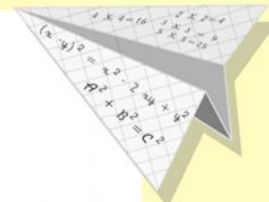


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

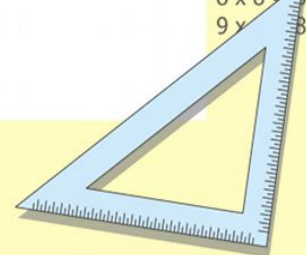
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$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$

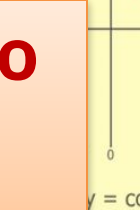
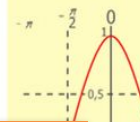
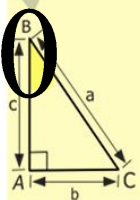
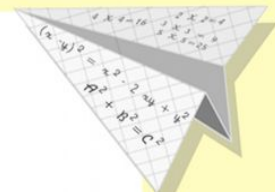


Десятичные логарифмы для наших потребностей являются весьма удобными. Однако при изучении высшей математики более удобными оказываются логарифмы по основанию $e = 2,718281828...$ (см. § 134, ч. 1). Употребление этих логарифмов позволяет значительно упростить большое количество математических формул. 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

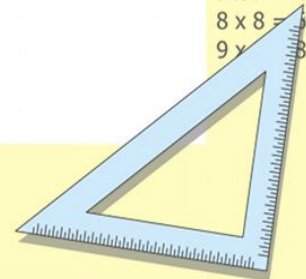


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$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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



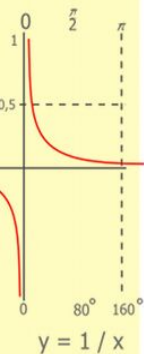
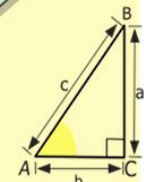
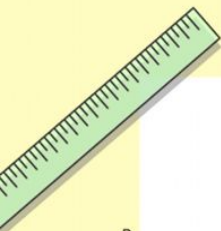
$$\ln 1 = 0$$

$$\ln e = 1$$

$$\ln e^r = r$$

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

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



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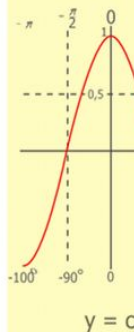
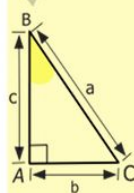
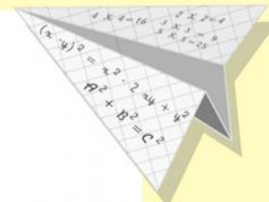
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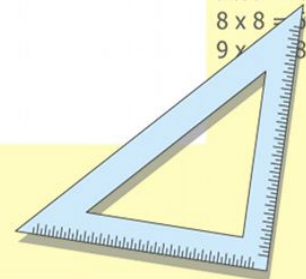


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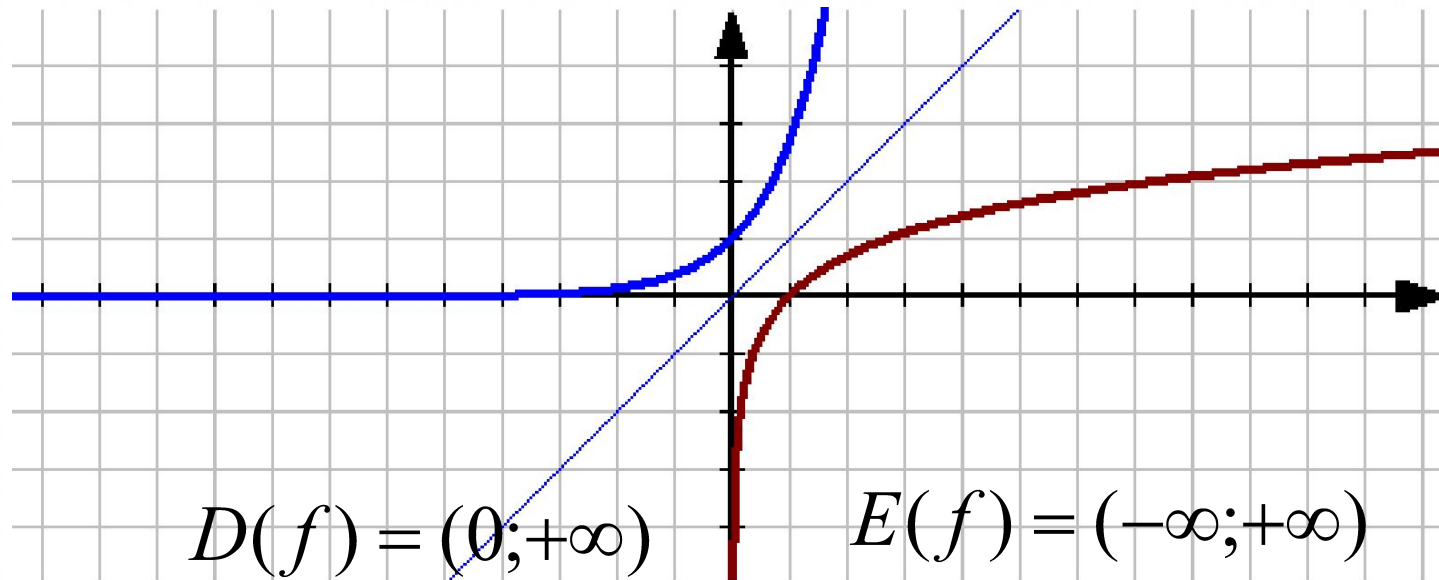
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Функция вида $y = \ln x$, свойства и график

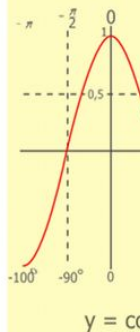
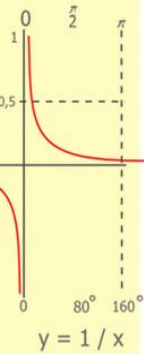
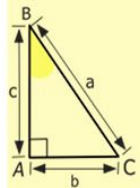
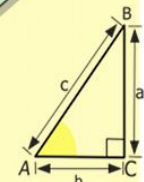
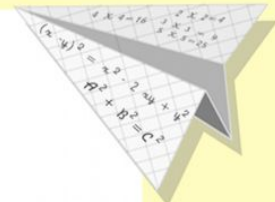
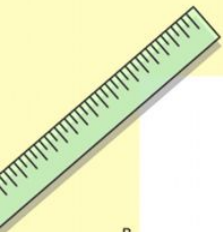


Ни четна, ни нечетна
Не ограничена ни сверху, ни снизу
Не имеет наибольшего, наименьшего значений
Непрерывна
Выпукла вверх
Дифференцируема

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

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

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



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 840 \\ \hline 10500 \end{array}$$

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



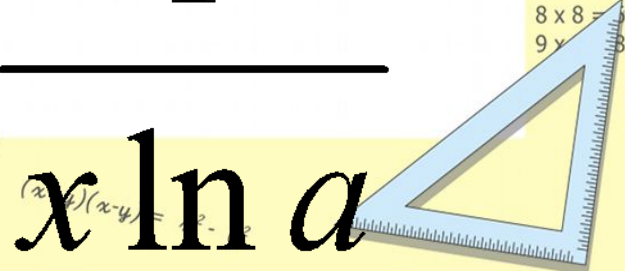
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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



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



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

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

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

$$y = \log_2 x$$

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

1633, 1634, 1635, 1636(a,б)

Дома: в,г

№1633

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

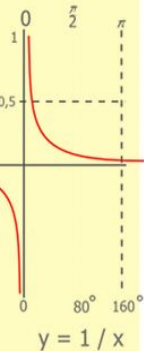
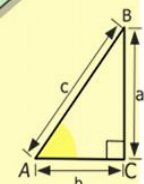
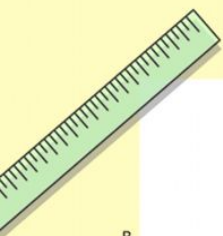
$$y' = (x^2)' \ln x + x^2 (\ln x)'$$

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

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

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

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



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



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

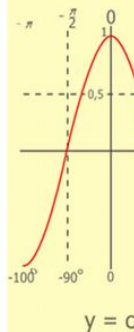
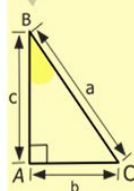
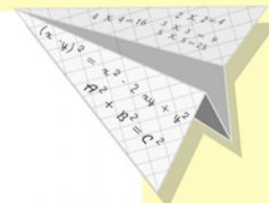
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

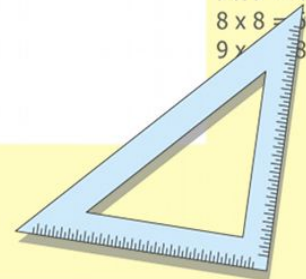


$$\begin{cases} = \sin 90 \\ x = 25 + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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



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



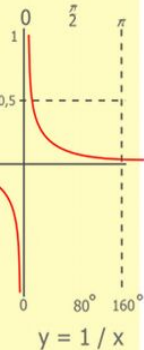
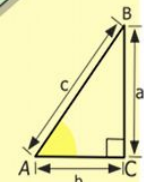
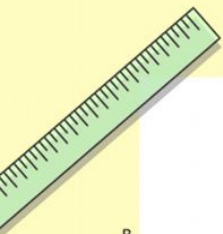
№1634

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

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

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

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



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



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

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

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

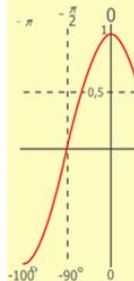
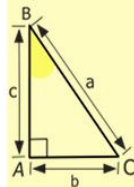
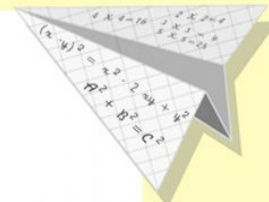


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

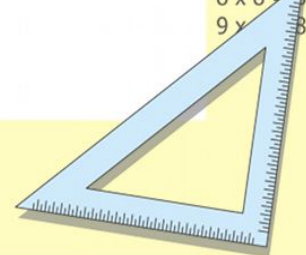
$$x = 70$$

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



$$y = \cos$$

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



№1635

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

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

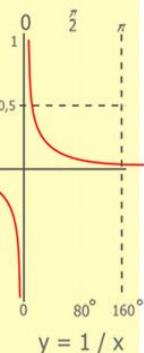
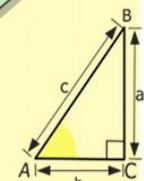
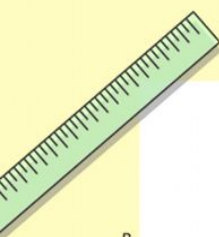
$$y' = 8$$

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

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

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

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

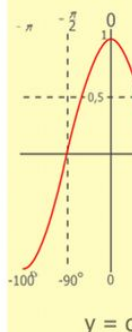
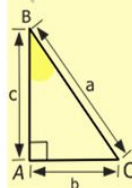
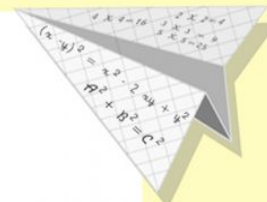


$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

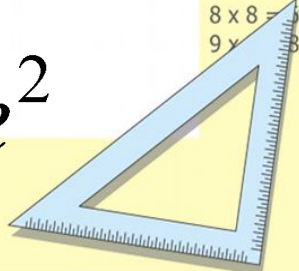


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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



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



№1636

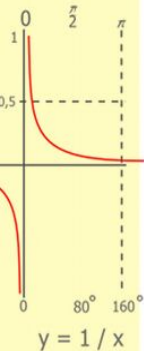
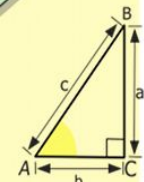
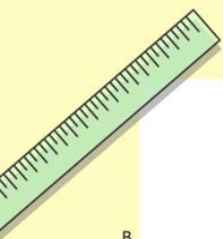
$$y = \ln(2x + 2), x_0 = -\frac{1}{4}$$

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

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

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

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



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



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

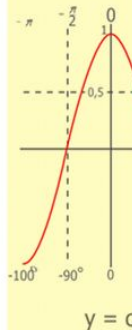
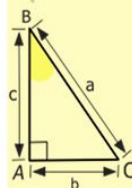
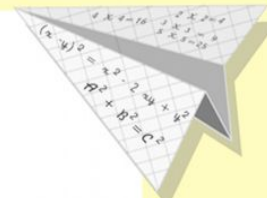
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

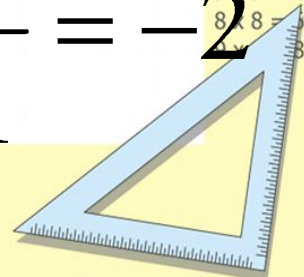


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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



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



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

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

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

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

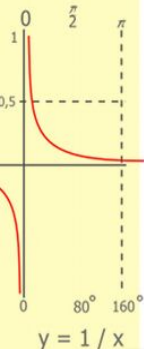
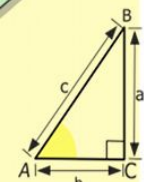
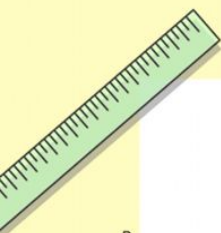
$$f'(x_0) = \frac{1}{e}$$

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

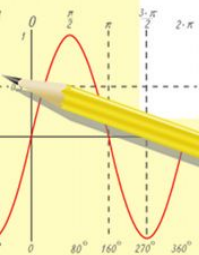
№1623,1637,16

41 (а,б)

В,г - дома



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



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

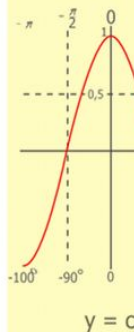
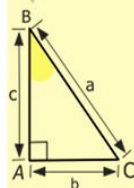
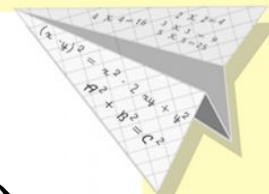
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

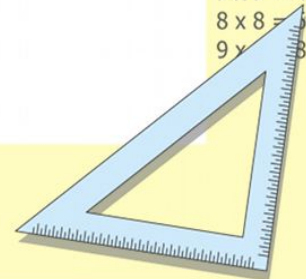


$$\begin{cases} y = \sin 90^\circ \\ x = 25 + 45 \end{cases}$$

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



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



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

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

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

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

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

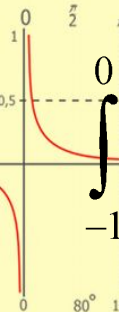
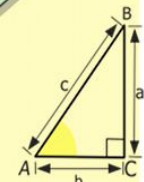
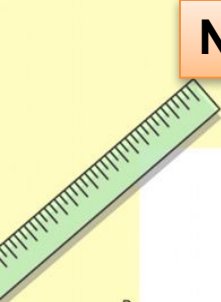
$$\frac{1}{2} \ln \frac{9}{3} = \frac{1}{2} \ln 3$$

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

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

$$x = 70$$

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

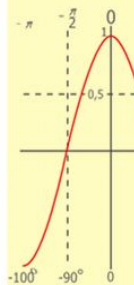
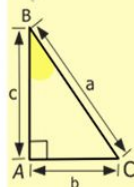
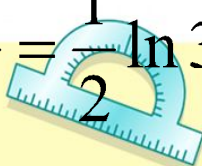


$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



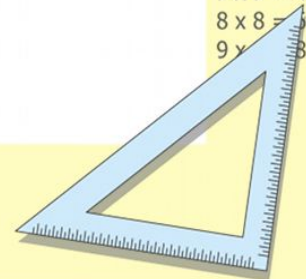
$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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



$$y = \cos$$

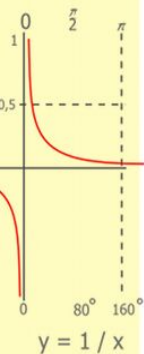
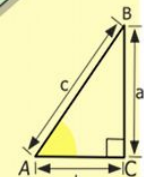
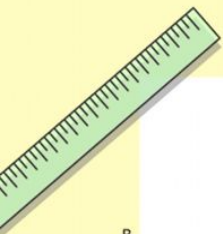
$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



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



$$S = \int_1^e \frac{dx}{x} = \ln x_1^e = \ln e - \ln 1 = 1$$



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



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

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

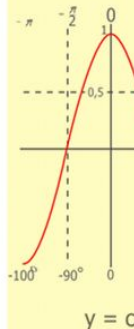
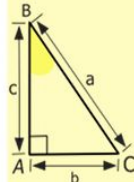
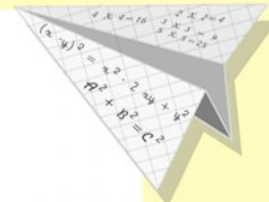
$$\sin 90^\circ = 1$$



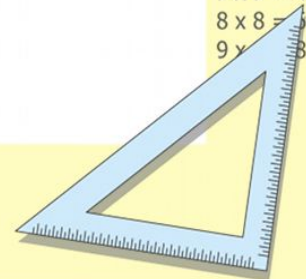
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

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



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

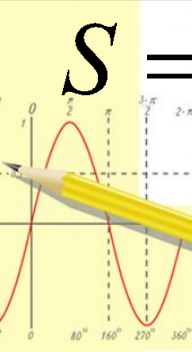
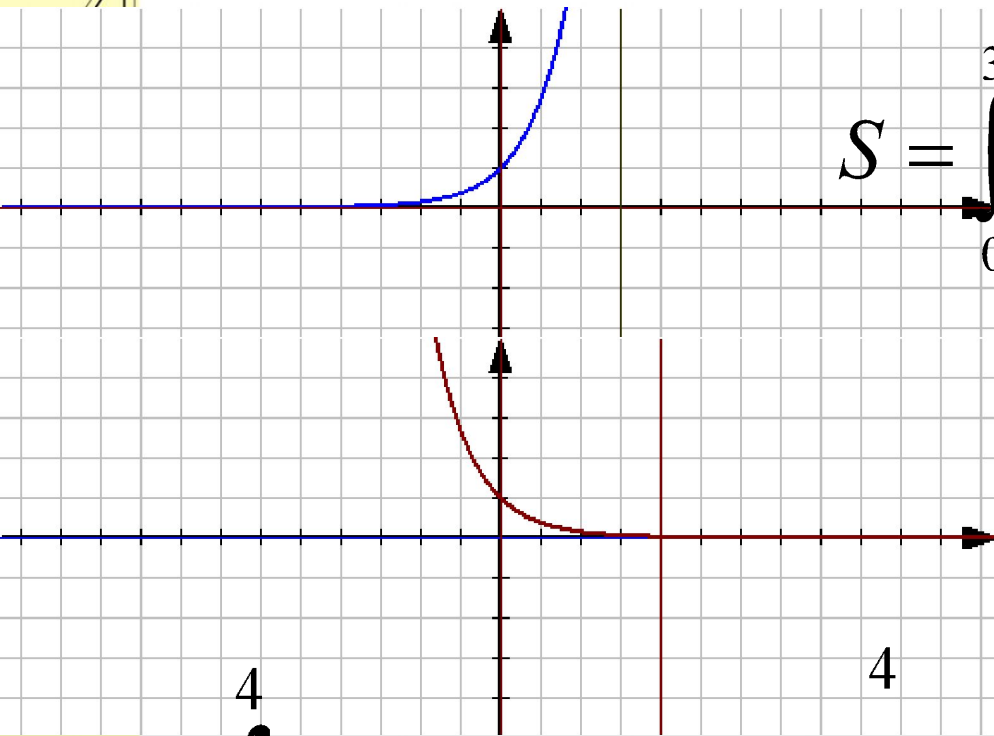
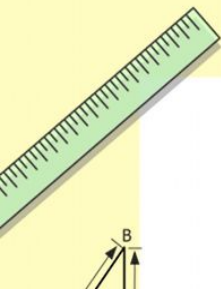


№1628, 1629, 1642, 1645 (а,б) дома: в,г

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

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

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



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

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

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

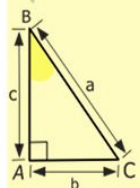
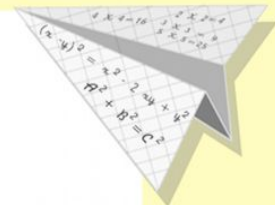


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

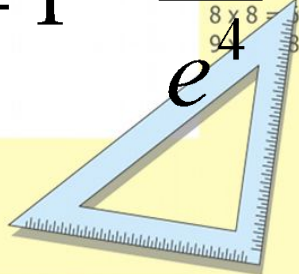
$$x = 70$$

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



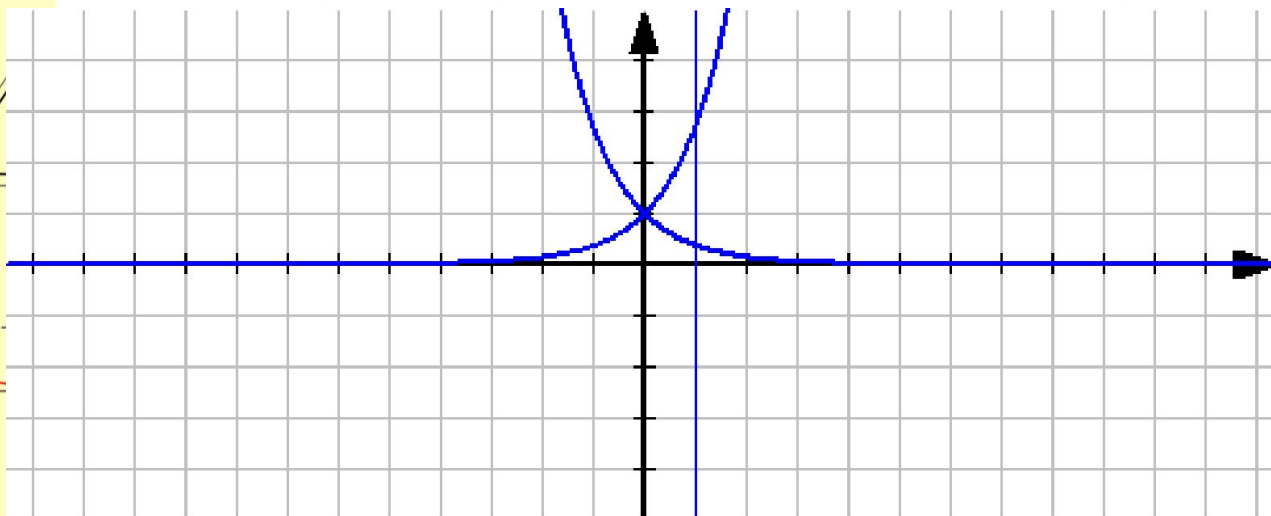
$$y = \cos$$

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



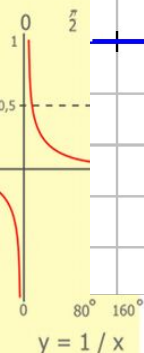
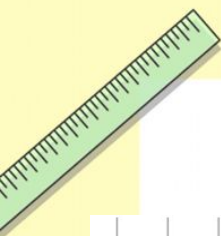
№1629 (a)

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



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

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



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



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

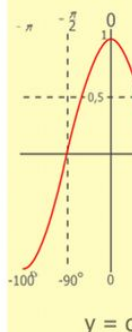
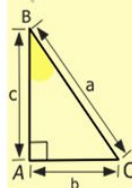
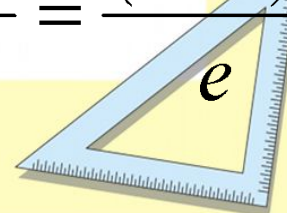
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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



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

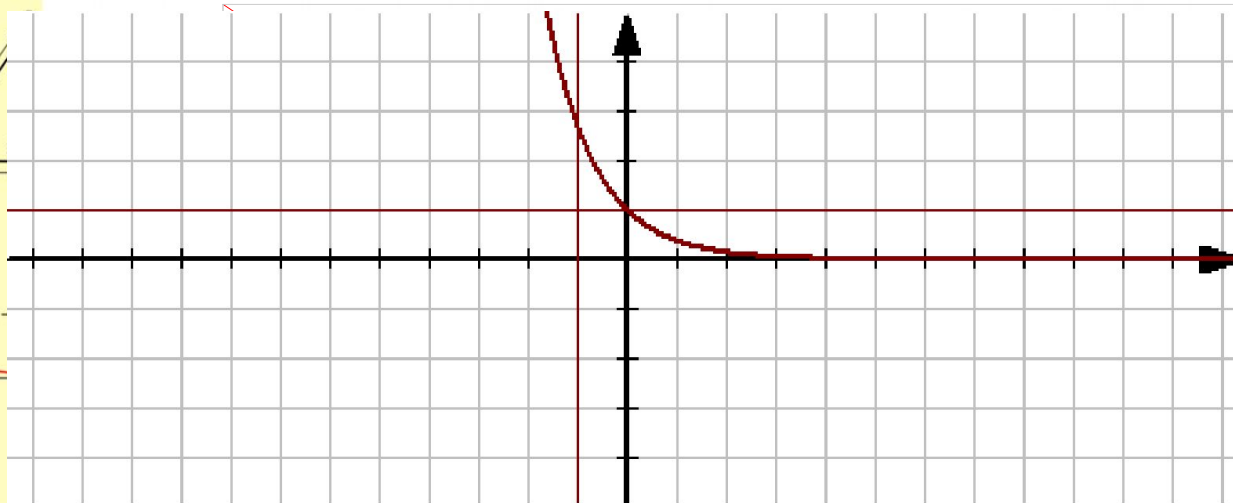
$$(x+y)(x-y) = x^2 - y^2$$



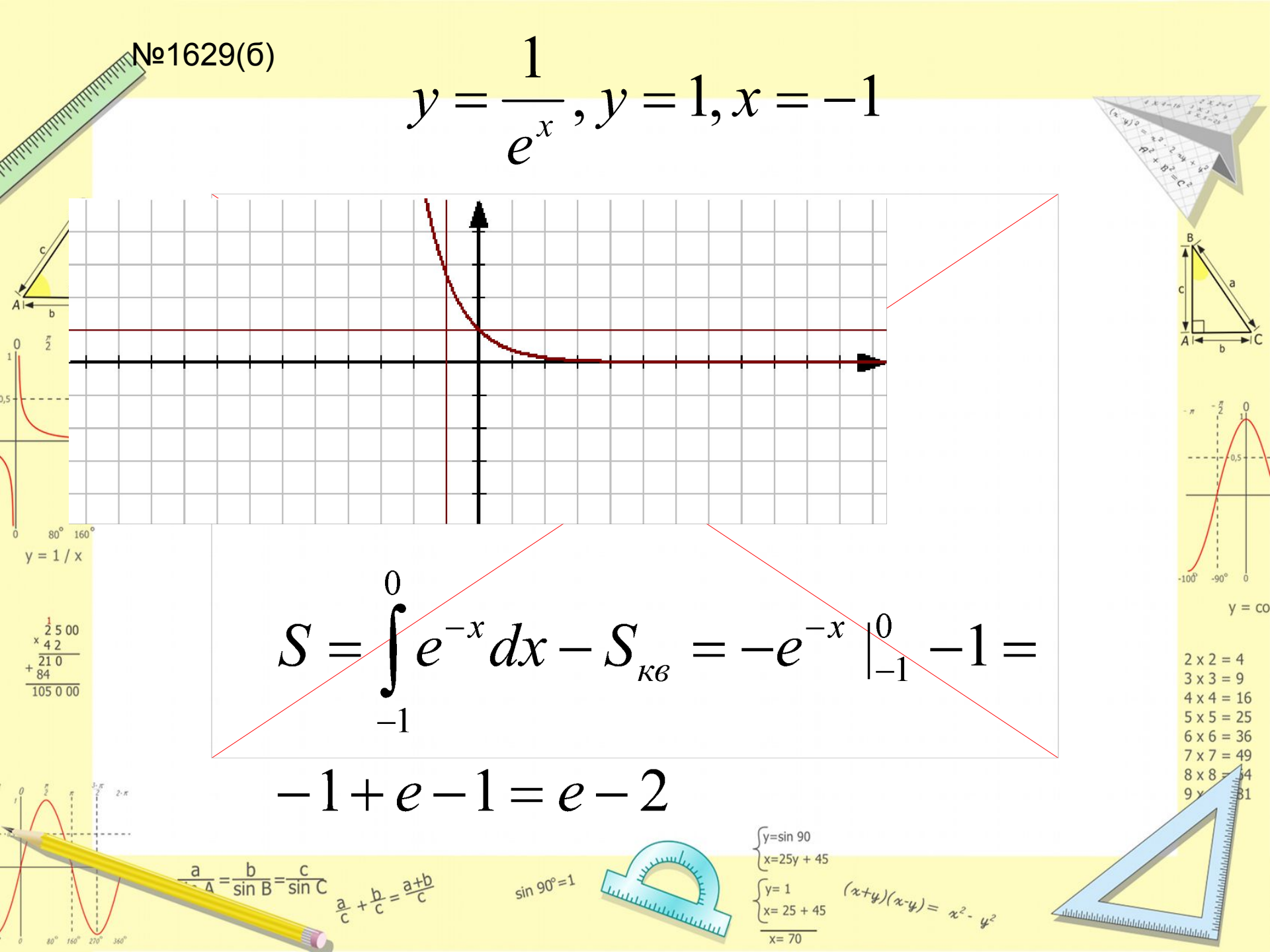
$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$

№1629(б)

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

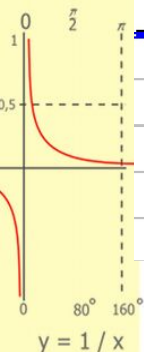
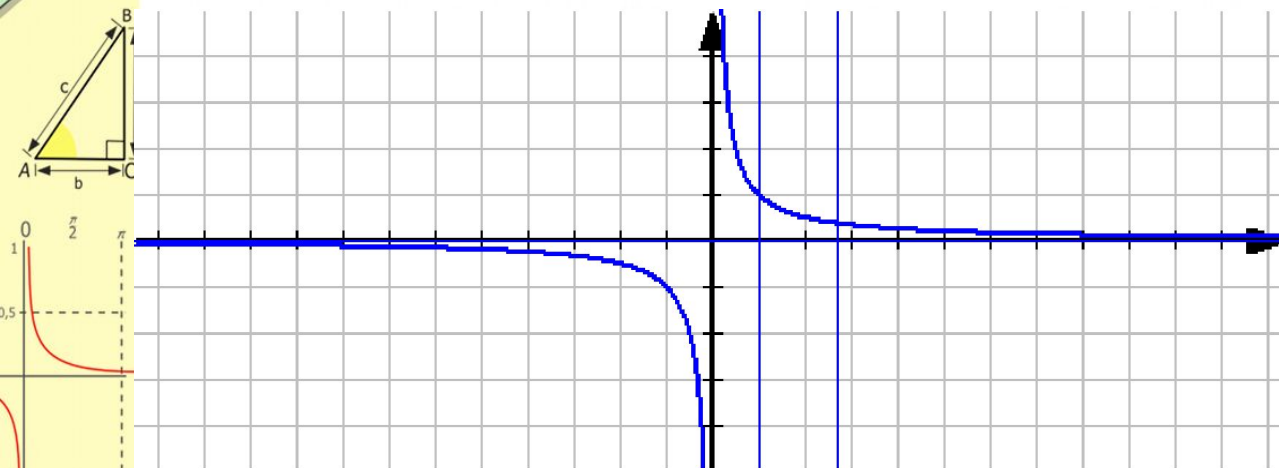


$$S = \int_{-1}^0 e^{-x} dx - S_{\text{кр}} = -e^{-x} \Big|_{-1}^0 - 1 = -1 + e - 1 = e - 2$$



№1642

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



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



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

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

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

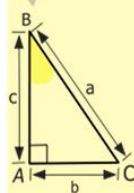
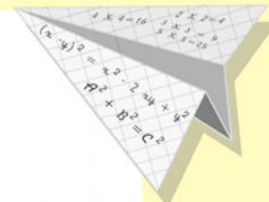


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

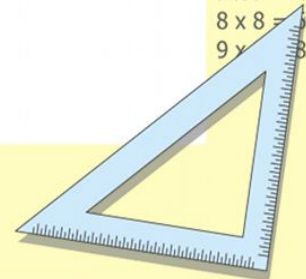
$$x = 70$$

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



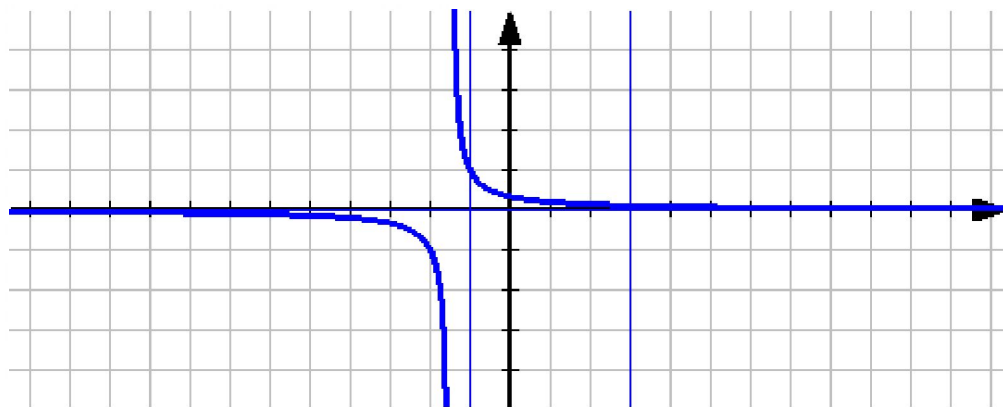
$$y = \cos$$

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



№1642(б)

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



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

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

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

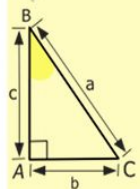
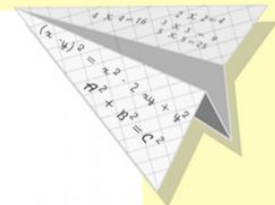
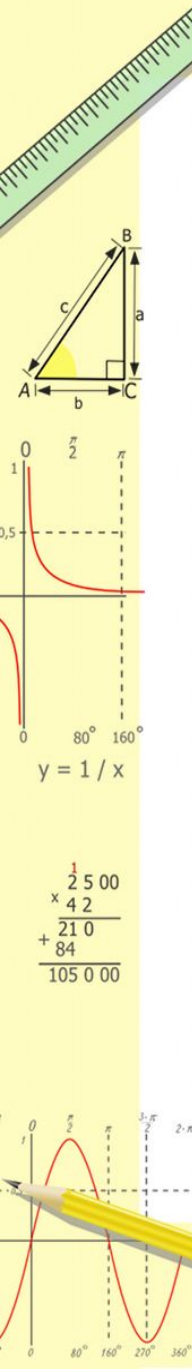
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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



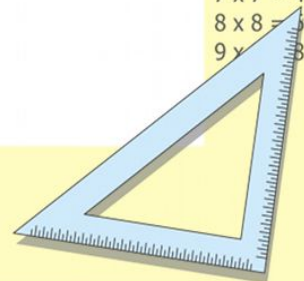
$$\begin{cases} x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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



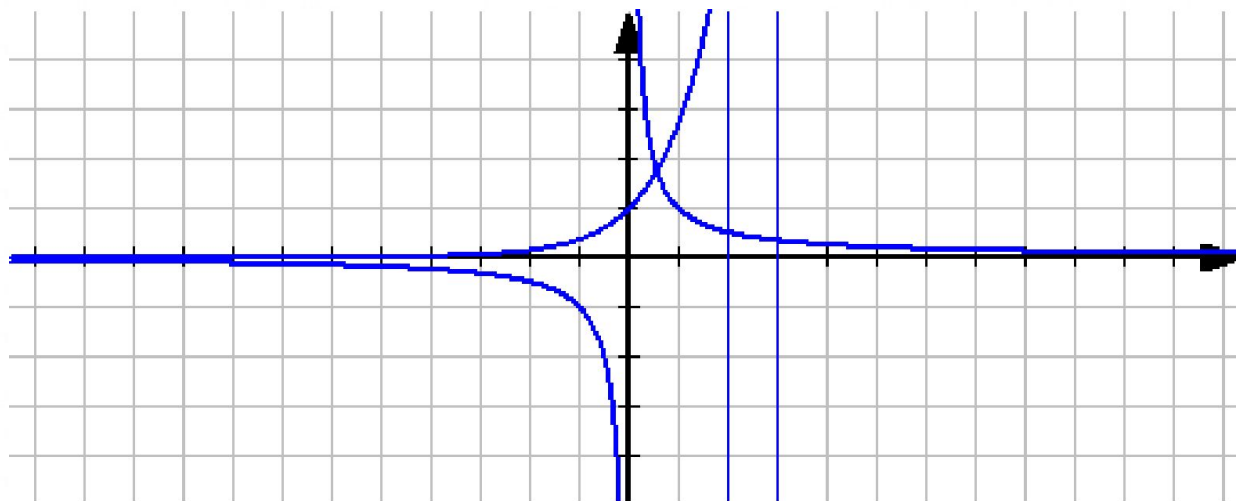
$$y = \cos$$

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



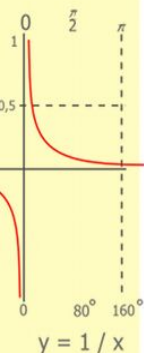
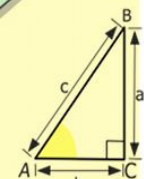
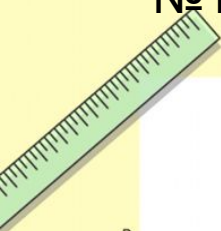
№1645 (a)

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



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

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



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



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

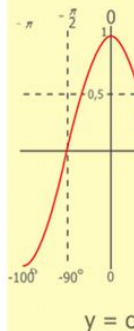
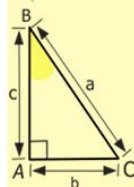
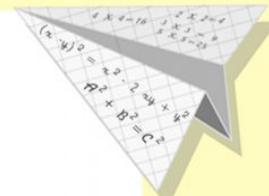
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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

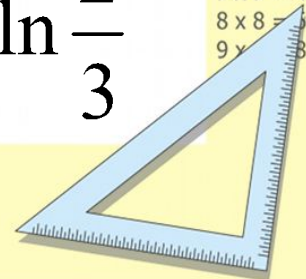


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

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

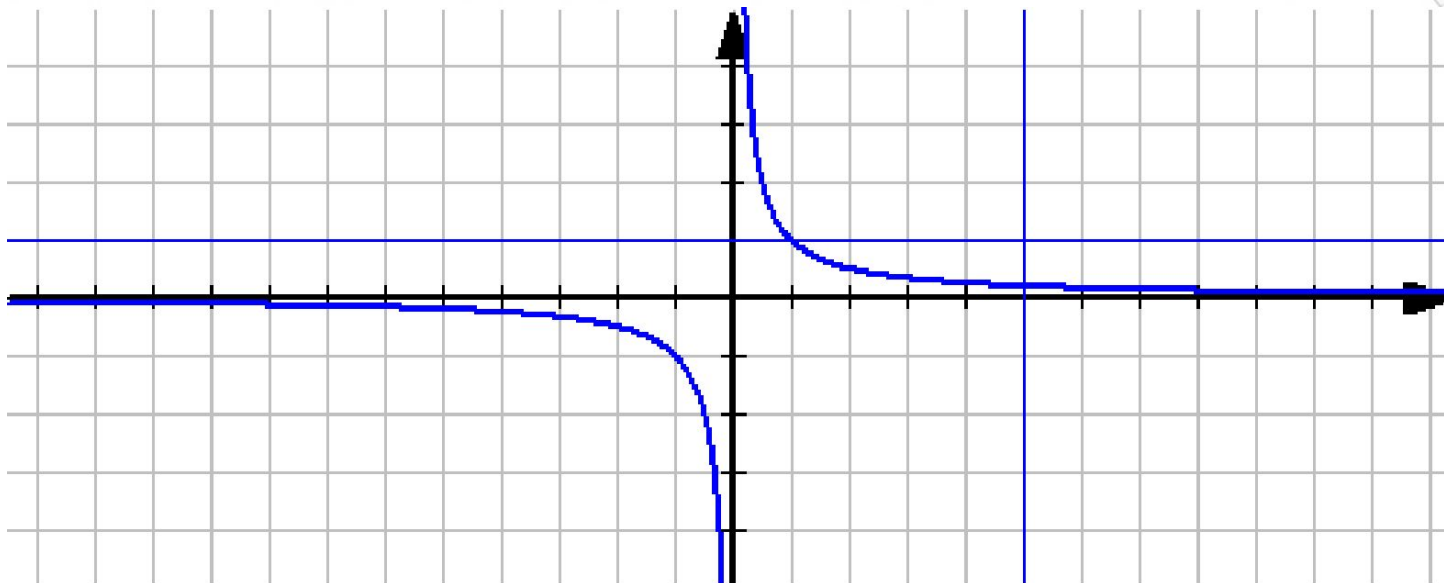


$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$

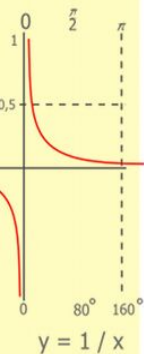
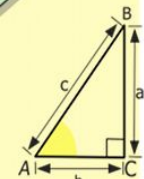


№1645(6)

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



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



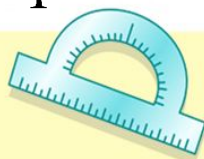
$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

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

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

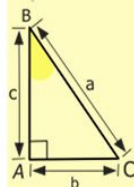
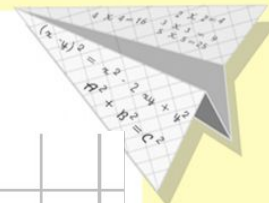


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

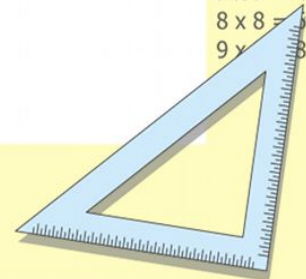
$$x = 70$$

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



$$y = \cos$$

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

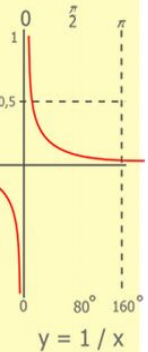
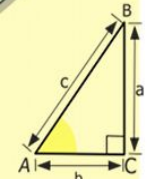
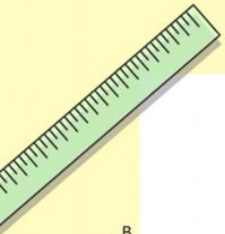


Задание на каникулы:

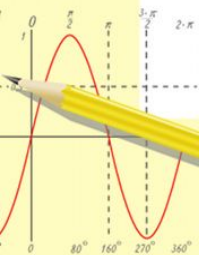
Создать справочник по формулам (лучше напечатать, чтобы можно было размножить), презентация, видеоролик и т.п.

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



$$\begin{array}{r} 1\ 5\ 00 \\ \times 4\ 2 \\ \hline 21\ 0 \\ + 84 \\ \hline 105\ 0\ 00 \end{array}$$



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

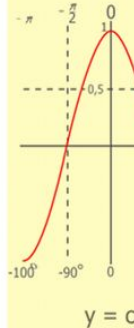
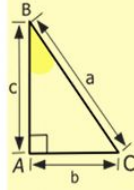
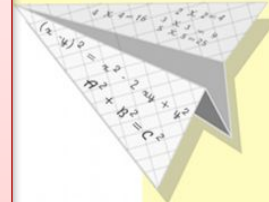
$$\frac{a}{c} + \frac{a}{c} = \frac{a}{c}$$

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



$$\begin{array}{l} y = 25x + 45 \\ y = 25 + 45 \\ x = 70 \end{array}$$

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



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

