19.02.2024
(понедельник)

1) $2^x = 2^3$

$x = 3$

2) Свойства степеней

$a^n \cdot a^m = a^{n+m}$

$a^n : a^m = a^{n-m}$

$(a^n)^m = a^{n \cdot m}$

$a^{-n} = \frac{1}{a^n}$

$a^0 = 1$

3) $8 = 2^3$

$4 = 2^2 = 4^1$

$\sqrt[2]{x^1} = x^{\frac{1}{2}}$

$\sqrt[12]{x^4} = x^{\frac{4}{12}} = x^{\frac{1}{3}}$

Решить уравнение (208—223).

208 1) $4^{x-1}=1$; 2) $0{,}3^{3x-2}=1$; 3) $2^{2x}=2^{4\sqrt{3}}$; 4) $\left(\frac{1}{3}\right)^{3x}=\left(\frac{1}{3}\right)^{-2}$.

$4^{x-1}=4^0$

$x-1=0$

$3x-2=0$

$x=2\sqrt{3}$

$3x=-2$

$x=-\frac{2}{3}$

209 1) $27^x = \frac{1}{3}$; 2) $400^x = \frac{1}{20}$; 3) $\left(\frac{1}{5}\right)^x = 25$; 4) $\left(\frac{1}{3}\right)^x = \frac{1}{81}$.

$3^{3x} = 3^{-3}$ $20^{2x} = 20^{-1}$ $5^{-1x} = 5^2$ $3^{-1x} = 3^{-4}$

$x = -1$ $2x = -1$ $x = -2$ $x = 4$

$x = -\frac{1}{2}$

210 1) $3 \cdot 9^x = 81$;

2) $2 \cdot 4^x = 64$;

3) $3^{x+\frac{1}{2}} \cdot 3^{x-2} = 1$;

4) $0{,}5^{x+7} \cdot 0{,}5^{1-2x} = 2$;

5) $0{,}6^x \cdot 0{,}6^3 = \frac{0{,}6^{2x}}{0{,}6^5}$;

6) $6^{3x} \cdot \frac{1}{6} = 6 \cdot \left(\frac{1}{6}\right)^{2x}$.

$3^1 \cdot 3^{2x} = 3^4$

$3^{2x+1} = 3^4$

$2x + 1 = 4$

$2x = 3$

$x = 1{,}5$

$3^{x+\frac{1}{2}} \cdot 3^{x-2} = 1$

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

$2x - 1{,}5 = 0$

$2x = 1{,}5$

$x = 0{,}75$

$6^{3x} \cdot 6^{-1} = 6^1 \cdot 6^{-2x}$

$6^{3x-1} = 6^{1-2x}$

$3x - 1 = 1 - 2x$

$3x + 2x = 1 + 1$

$5x = 2$

$x = 0{,}4$

211 1) $3^{2x-1} + 3^{2x} = 108$; 2) $2^{3x+2} - 2^{3x-2} = 30$;

3) $2^{x+1} + 2^{x-1} + 2^x = 28$; 4) $3^{x-1} - 3^x + 3^{x+1} = 63$.

$\frac{3^{2x}}{3} + 3^{2x} = 108$

$3^{2x}\left(\frac{1}{3} + 1\right) = 108$

$3^{2x} \cdot \frac{4}{3} = 108$

$3^{2x} = 108 \cdot \frac{3}{4}$

$3^{2x} = 81$

$3^{2x-1} = \frac{3^{2x}}{3^1}$

$3^{2x} = t \Rightarrow 3^{2x} = 81$

$\frac{t}{3} + t = 108$ $\quad 3^{2x} = 3^4$

$\frac{t+3t}{3} = 108 \mid \cdot 3$ $\quad x = 2$

$t + 3t = 324$

$4t = 324$

$t = 81$

214 1) $3^{x^2+x-12}=1$; 2) $2^{x^2-7x+10}=1$;

3) $2^{\frac{x-1}{x-2}}=4$; 4) $0{,}5^{\frac{1}{x}}=4^{\frac{1}{x+1}}$.

1) $3^{x^2+x-12}=3^0$

$x^2+x-12=0$

3) $2^{\frac{x-1}{x-2}}=2^2$

$\frac{x-1}{x-2}=2 \mid \cdot(x-2)$

$x-1=2(x-2)$

221 1) $2^{|x-2|} = 2^{|x+4|}$;

3) $3^{|x+1|} = 3^{2-|x|}$;

$|x-2| = |x+4|$

$x-2 = x+4$

$-x+2 = x+4$

$-x+2 = -x-4$

$x-2 = -x-4$

Решить неравенство (228—229).

228 1) $3^x > 9$; 2) $\left(\frac{1}{2}\right)^x > \frac{1}{4}$; 3) $\left(\frac{1}{4}\right)^x < 2$;

4) $4^x < \frac{1}{2}$; 5) $2^{3x} \geqslant \frac{1}{2}$; 6) $\left(\frac{1}{3}\right)^{x-1} \leqslant \frac{1}{9}$.

1) $3^x > 3^2$

$x > 2$

$x \in (2; +\infty)$

2) $\left(\frac{1}{2}\right)^x > \frac{1}{4}$

$\left(\frac{1}{2}\right)^x > \left(\frac{1}{2}\right)^2$

$x > 2$

$\left(\frac{1}{2}\right)^2 = \frac{1^2}{2^2} = \frac{1}{4}$

5) $2^{3x} \geq \frac{1}{2}$

$2^{3x} \geq 2^{-1}$

$3x \geq -1$

$x \geq -\frac{1}{3}$

6) $\left(\frac{1}{3}\right)^{x-1} \leq \left(\frac{1}{3}\right)^2 \Rightarrow x - 1 \leq 2$

$x \leq 3$

229 1) $5^{x-1} \leqslant \sqrt{5}$; 2) $3^{\frac{x}{2}} > 9$; 3) $3^{x^2-4} \geqslant 1$; 4) $5^{2x^2-18} < 1$.

230 **Решить графически уравнение:**

1) $\left(\frac{1}{3}\right)^x = x + 1$; 2) $\left(\frac{1}{2}\right)^x = x - \frac{1}{2}$;

3) $2^x = -x - \frac{7}{4}$; 4) $3^x = 11 - x$.

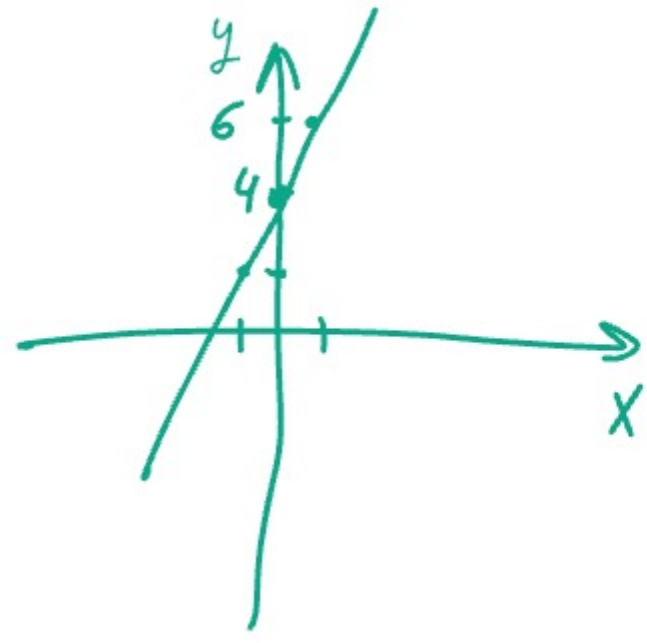
1) $5^{x-1} \leq \sqrt{5}$

$5^{x-1} \leq 5^{\frac{1}{2}}$

$x - 1 \leq \frac{1}{2}$

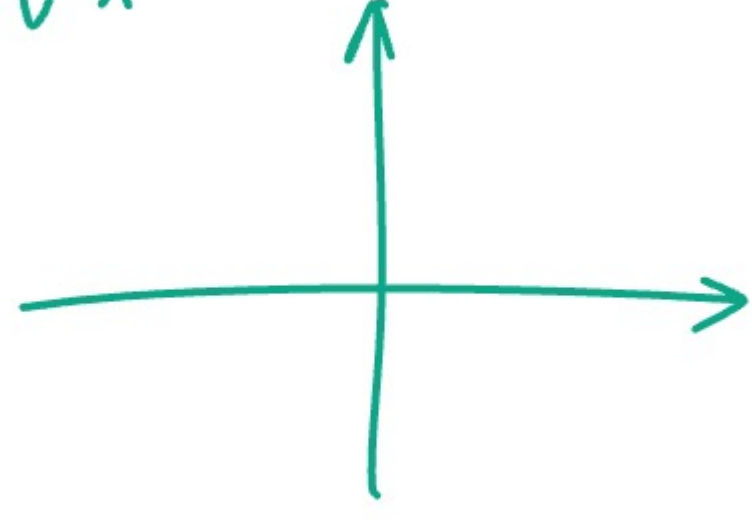
$y = 2x + 4$

x	0	1	-1
y	4	6	2

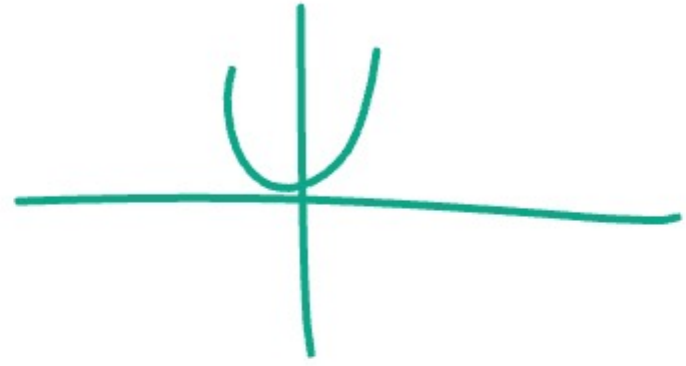


$y = x^2$; $y = \frac{1}{x}$; $y = \sqrt{x}$

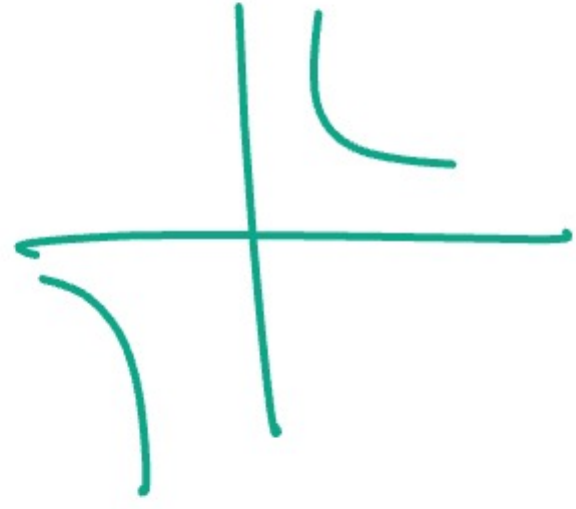
x	
y	



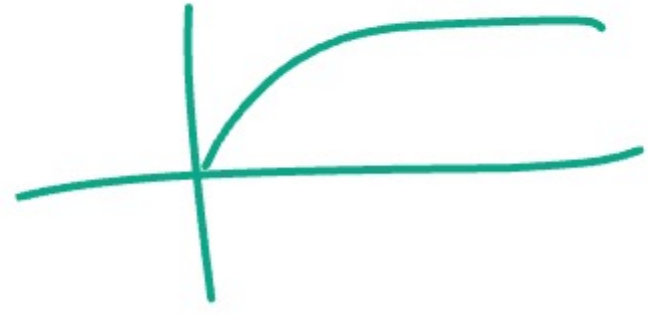
$y = x^2$



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

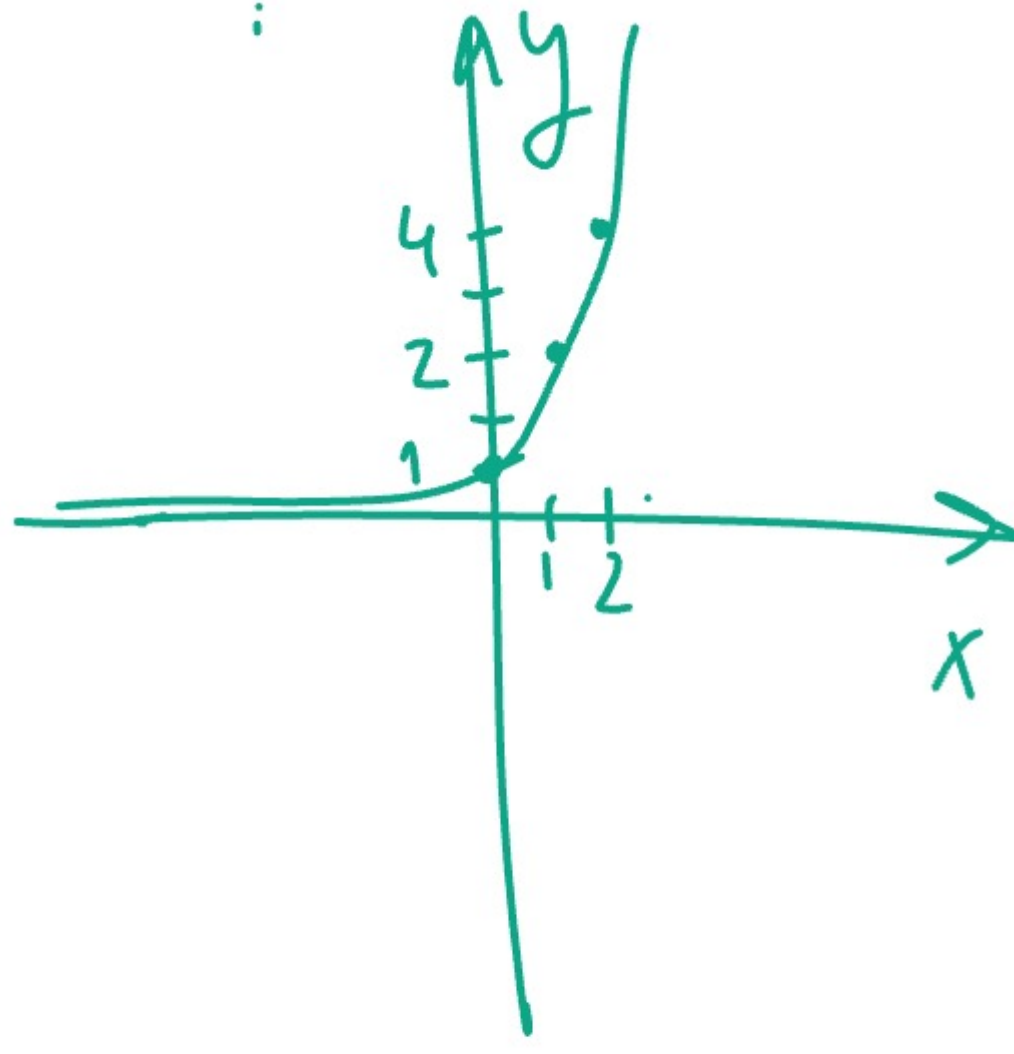


$y = \sqrt{x}$



$y = 2^x$

x	1	2	0
y	2	4	1



1) $\begin{cases} 2x - y = 1, \\ 5^{x+y} = 25; \end{cases}$

① $2x - y = 1$

② $5^{x+y} = 25$

$5^{x+y} = 5^2$

$x + y = 2$

③ $\begin{cases} 2x - y = 1 \\ x + y = 2 \end{cases}$

$y = 2 - x$

$2x - 2 + x = 1$

$3x = 3 \Rightarrow x = 1$

$y = 1$

1) $\begin{cases} 2x - y = 1, \\ 5^{x+y} = 25; \end{cases}$

① $2x - y = 1$

$y = 2x - 1$

$y = 2 - 1 = 1$

② $5^{x+2x-1} = 5^2$

$x + 2x - 1 = 2$

$3x = 3$

$x = 1$

1) $\begin{cases} 4^x \cdot 2^y = 32, \\ 3^{8x+1} = 3^{3y}; \end{cases}$

$\begin{cases} 4^x \cdot 2^y = 4^2 \cdot 2^2 \\ 8x+1 = 3y \end{cases}$

$\begin{cases} 2x+y = 5 \\ 8x+1 = 3y \end{cases}$

① $4^x \cdot 2^y = 4^2 \cdot 2^1$

$2^{2x} \cdot 2^y = 2^4 \cdot 2^1$

$2^{2x+y} = 2^5$

$2x+y = 5$

$$2x + y = 5$$

$$y = 5 - 2x \quad \Longrightarrow \quad y = 3$$

$$8x + 1 = 3 \cdot (5 - 2x)$$

$$8x + 1 = 15 - 6x$$

$$14x = 14$$

$$x = 1$$

246 Сравнить числа:

1) $4^{-\sqrt{3}}$ и $4^{-\sqrt{2}}$;

2) $2^{\sqrt{3}}$ и $2^{1,7}$;

3) $\left(\frac{1}{2}\right)^{1,4}$ и $\left(\frac{1}{2}\right)^{\sqrt{2}}$;

4) $\left(\frac{1}{9}\right)^{\pi}$ и $\left(\frac{1}{9}\right)^{3,14}$.

1) $4^{-\sqrt{3}} > 4^{-\sqrt{2}} \quad \Big| \uparrow (-1)$

$4^{-\sqrt{3}\cdot(-1)} > 4^{-\sqrt{2}\cdot(-1)}$

$4^{\sqrt{3}} > 4^{\sqrt{2}}$

Решите уравнение $(x-6)^2 = -24x$.

$x^2 - 12x + 36 = -24x$

$x^2 - 12x + 36 + 24x = 0$

$x^2 + 12x + 36 = 0$

$D = \ldots$

а) Решите уравнение $27^x - 5 \cdot 9^x - 3^{x+2} + 45 = 0$.

$3^x \cdot 9^x - 5 \cdot 9^x - 3^x \cdot 3^2 + 5 \cdot 9 = 0$

$3^x(9^x - 9) - 5(9^x - 9) = 0$

$(9^x - 9)(3^x - 5) = 0$

$9^x - 9 = 0$ $\quad$ $3^x - 5 = 0$

$9^x = 9^1$ $\quad$ $3^x = 5$

$x = 1$ $\quad$ $x = \log_3 5$

$\log_a b = x$ | $\log_2 4 = 2$

$a^x = b$ | $\log_3 27 = 3$

$3^x = 2$

$3^1 = 3$

$3^{\frac{1}{2}} = \sqrt{3} = 1{,}73$

$\log_3 2 = 0{,}6$