$$\left(-\frac{2}{3}\right)^{-2} = \frac{1}{\left(-\frac{2}{3}\right)^2} = \frac{1}{\frac{4}{9}} = \frac{1}{1}\cdot\frac{9}{4} = \underline{\underline{\frac{9}{4}}}$$

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

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

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

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

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

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

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

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

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

$x \neq 0$
$x \neq -1$
$x \neq 1$

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

$$= \frac{1}{\frac{3ax^2}{\frac{1}{b}\cdot x}} = \frac{1}{\frac{3ax^2}{1}\cdot\frac{b}{x}} = \frac{1}{\frac{3abx^2}{x}} = \frac{1}{1}\cdot\frac{x}{3abx^2} =$$

$$= \frac{1}{3abx}$$

$a \neq 0$
$b \neq 0$
$x \neq 0$

ŘEŠTE ROVNICI S NEZNÁMOU $x \in R$

$$x^2 - 6x - 7 = 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_{1,2} = \frac{-(-6) \pm \sqrt{(-6)^2 - 4\cdot 1\cdot(-7)}}{2\cdot 1}$$

$$x_{1,2} = \frac{6 \pm \sqrt{36 - (-28)}}{2}$$

$$x_{1,2} = \frac{6 \pm \sqrt{64}}{2}$$

$$x_{1,2} = \frac{6 \pm 8}{2} \quad x_1 = 7, \quad x_2 = -1$$

$K = \{7, -1\}$

URČETE DEFINIČNÍ OBOR FCE:

$$f(x) = \sqrt{\log x}$$

$x > 0$ pro logaritmus, ale zadání menší než 1, by bylo ZÁPORNÉ ČÍSLO

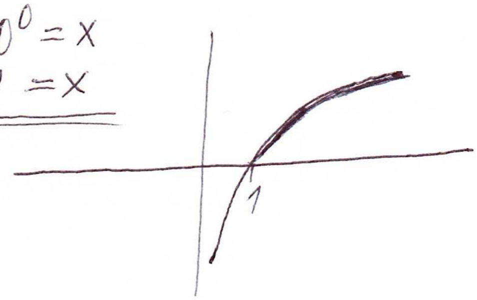
$x \geq 0$ pro odmocninu

$\log x = 0$

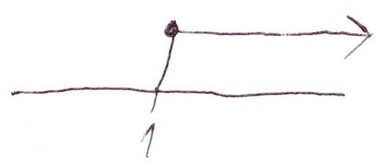
$\log_{10} x = 0$

$10^0 = x$

$1 = x$



$$x \in \langle 1, +\infty)$$



NAKRESLETE GRAF FCE A OZNAČTE PRŮSEČÍKY SE SOUŘADNICOVÝMI OSAMI

$y = 2x - 4$

$P_x = ?$ $y = 0$

$0 = 2x - 4 \quad / -2x$

$-2x = -4 \quad / \cdot (-1)$

$2x = 4 \quad / : 2$

$x = 2$

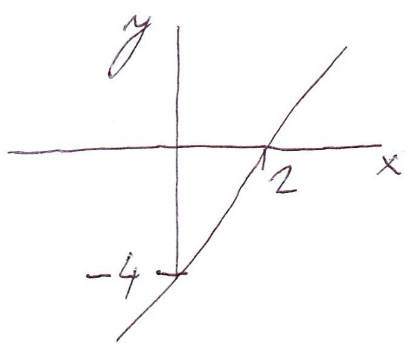
$P_x [2, 0]$

$P_y = ?$ $x = 0$

$y = 2 \cdot 0 - 4$

$y = -4$

$P_y [0, -4]$



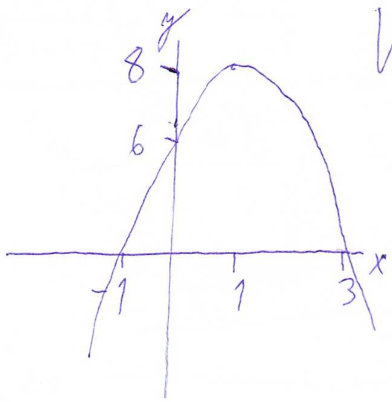
$$y = 6 + 4x - 2x^2$$

$$y = -2x^2 + 4x + 6$$

$$y = -2(x^2 - 2x) + 6$$

$$y = -2(x^2 - 2x + 1) - 1 \cdot (-2) + 6$$

$$y = -2(x-1)^2 + 8$$



$V[1, 8]$

$P_y = ?$ $x = 0$

$$y = -2 \cdot 0^2 + 4 \cdot 0 + 6$$

$$y = 6$$

$P_y[0, 6]$

$$y = -2x^2 + 4x + 6$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_{1,2} = \frac{-4 \pm \sqrt{4^2 - 4 \cdot (-2) \cdot 6}}{2 \cdot (-2)}$$

$$x_{1,2} = \frac{-4 \pm \sqrt{16 - 48}}{-4}$$

$$x_{1,2} = \frac{-4 \pm 8}{-4}$$

$x_1 = -1$

$x_2 = 3$

$P_x[-1, 0]$

$P_x[3, 0]$

KONTROLA VRCHOLU POMOCÍ DERIVACE

$f' = (-2x^2 + 4x + 6)'$

$f' = -4x + 4$

$0 = -4x + 4 \quad / + 4x$

$4x = 4 \quad / : 4$

$x = 1$

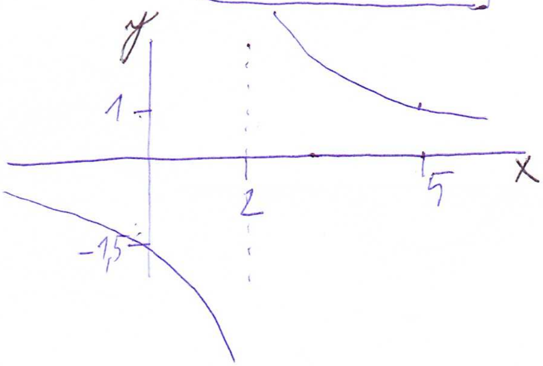
$y = -2 \cdot 1^2 + 4 \cdot 1 + 6$

$y = -2 + 4 + 6$

$y = 8$

$V[1, 8]$

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



$P_x = ?$ $y = 0$

$$0 = \frac{3}{x-2} \quad / \cdot (x-2)$$

$$0 = 3$$

$P_x = ?$ $y = 1$

$$1 = \frac{3}{x-2} \quad / \cdot (x-2)$$

$$(x-2) = 3$$

$$x - 2 = 3 \quad / + 2$$

$$x = 5$$

$P_x \, [5, 1]$

$P_y = ?$ $x = 0$

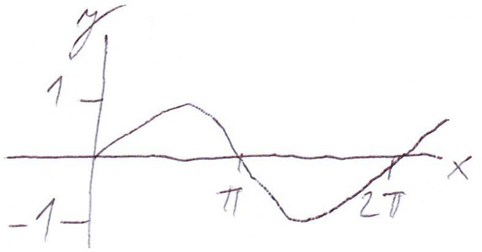
$$y = \frac{3}{0-2}$$

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

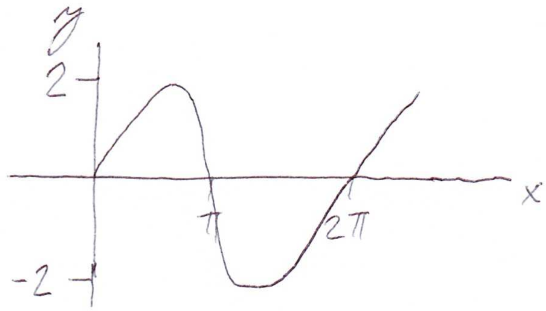
$$y = -1{,}5$$

$P_y \, [0, -\frac{1}{5}]$

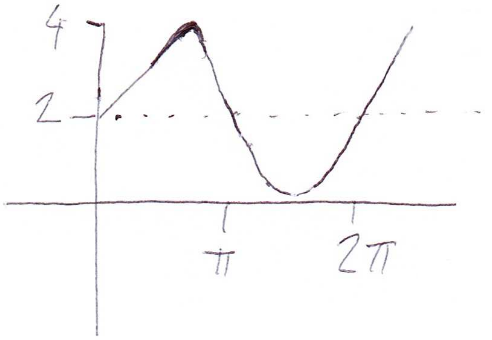
$2 + 2\sin x$



$\sin x$



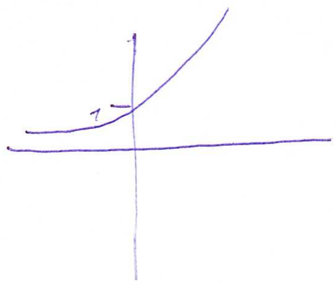
$2\sin x$



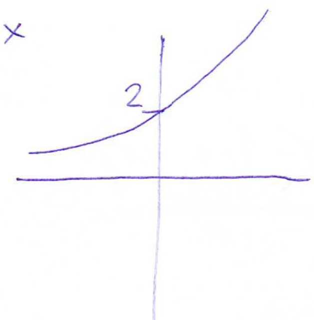
$2 + 2\sin x$

$y = 2 \cdot 3^{-x}$ dle vzorce $\boxed{y = a^x}$

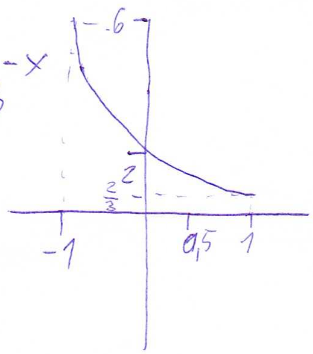
3^x



$2 \cdot 3^x$



$2 \cdot 3^{-x}$



$P_y = ?$ $x = 0$

$y = 2 \cdot 3^{-0}$

$y = 2 \cdot 1$

$y = 2$

$P_y [0, 2]$

$P_y = ?$ $x = -1$

$y = 2 \cdot 3^{-(-1)}$

$y = 2 \cdot 3$

$y = 6$

$P_y [-1, 6]$

$P_y = ?$ $x = 1$

$y = 2 \cdot 3^{-1}$

$y = 2 \cdot \frac{1}{3}$

$y = \frac{2}{3}$

$P_y [1, \frac{2}{3}]$

$$\left(\frac{1}{64}\right)^{\frac{1}{3}} + 9^{\frac{2}{4}} \cdot 8^{-\frac{2}{3}} =$$

$$= \frac{\sqrt[3]{1}}{\sqrt[3]{64}} + 9^{\frac{1}{2}} \cdot \frac{1}{8^{\frac{2}{3}}} =$$

$$= \frac{1}{4} + \sqrt{9} \cdot \frac{1}{\sqrt[3]{8^2}} =$$

$$= \frac{1}{4} + 3 \cdot \frac{1}{\sqrt[3]{64}} =$$

$$= \frac{1}{4} + 3 \cdot \frac{1}{4} =$$

$$= \frac{1}{4} + \frac{3}{4} =$$

$$= \frac{1+3}{4} =$$

$$= \frac{4}{4} =$$

$$= \underline{1}$$

$$\frac{\frac{1}{x}-1}{\frac{1+x}{x}} : \frac{x-1}{x} =$$

$$= \left(\frac{1}{x}-\frac{1}{1}\right)\cdot\left(\frac{x}{1+x}\right)\cdot\left(\frac{x}{x-1}\right) =$$

$$= \left(\frac{1-x}{x}\right)\cdot\left(\frac{x}{1+x}\right)\cdot\left(\frac{x}{x-1}\right) =$$

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

$$= \frac{x\,(1-x)}{x\,(1+x)}\cdot\frac{x}{x-1} =$$

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

$$= -\frac{1}{1}\,\frac{(x-1)}{(1+x)}\cdot\frac{x}{x-1} =$$

$$= -\frac{1}{1}\,\frac{1}{(1+x)}\cdot\frac{x}{1} =$$

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

$x \neq -1$

$x \neq 0$

$x \neq 1$

$$3x - 2y = 2$$
$$2x + y = 6$$

$$3x - 2y = 2 \quad / \cdot (-2)$$
$$2x + y = 6 \quad / \cdot 3$$

$$-6x + 4y = -4$$
$$6x + 3y = 18 \quad / +$$

$$7y = 14 \quad /:7$$
$$y = 2$$

$$3x - 2 \cdot 2 = 2$$
$$3x - 4 = 2 \quad /+4$$
$$3x = 6 \quad /:3$$
$$x = 2$$

$$K = \{[x, y] = [2, 2]\}$$

ZK: $L_1 = 3 \cdot 2 - 2 \cdot 2 = 2$

$P_1 = 2$

$L_1 = P_1 \wedge L_2 = P_2$

$L_2 = 2 \cdot 2 + 2 = 6$

$P_2 = 6$

$$2x^2-4x+2=0$$

$$2x^2-4x+2=0$$

$$x_{1,2}=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x_{1,2}=\frac{-(-4)\pm\sqrt{(-4)^2-4\cdot2\cdot2}}{2\cdot2}$$

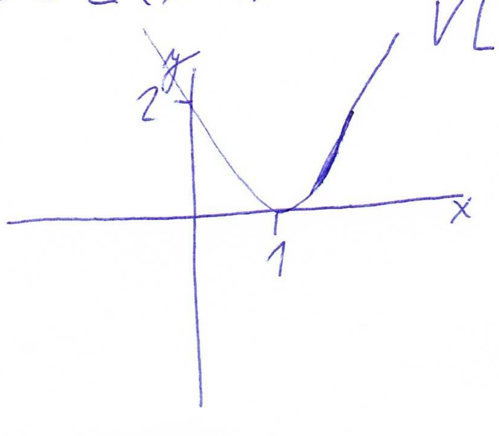
$$x_{1,2}=\frac{4\pm\sqrt{16-16}}{4}$$

$$x_{1,2}=\frac{4\pm0}{4} \quad x_1=1,\quad x_2=1$$

VÍCENÁSOBNÝ KOŘEN

$$y=2x^2-4x+2$$
$$y=2(x^2-2x)+2$$
$$y=2(x^2-2x+1)-2\cdot1+2$$
$$y=2(x-1)^2-2+2$$
$$y=2(x-1)^2$$

$V[1,0]$



OVĚŘENÍ VRCHOLU

$$f'=(2x^2-4x+2)'$$
$$f'=4x-4$$

$$4x-4=0 \quad /+4$$
$$4x=4 \quad /:4$$
$$x=1$$

$$y=2\cdot1^2-4\cdot1+2$$
$$y=0$$

$P_y=?\quad x=0$

$$y=2\cdot0^2-4\cdot0+2$$
$$y=2$$

$P_y[0,2]$

$$2^x \cdot 4 = 16$$

$$2^x \cdot 2^2 = 2^4$$

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

$$x+2 = 4 \quad /-2$$

$$\underline{\underline{x = 2}}$$

$$\log_4 x = \frac{3}{2}$$

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

$$\sqrt{4^3} = x$$

$$\sqrt{64} = x$$

$$8 = x$$

$$\underline{\underline{K = \{8\}}}$$

$$f(x) = \sqrt{x - \frac{2}{5}} + \sqrt{\frac{4}{5} - x}$$

① ②

① $x - \frac{2}{5} \geq 0$ podmínka pro odmocninu

$x - \frac{2}{5} \geq 0 \quad / + \frac{2}{5}$

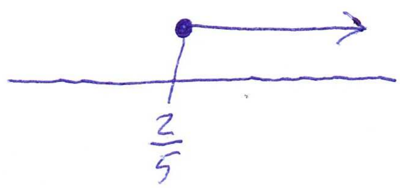
$x \geq \frac{2}{5}$

$\left(x - \frac{2}{5}\right) = 0$

$x_0 = \frac{2}{5}$

	$(-\infty, \frac{2}{5})$	$(\frac{2}{5}, +\infty)$
$(x - \frac{2}{5})$	$-$	$+$
	⊖	⊕

↖ chceme viz $x \geq \frac{2}{5}$



$\left\langle \frac{2}{5}, +\infty \right)$

② $\frac{4}{5} - x \geq 0$ podmínka pro odmocninu

$\frac{4}{5} - x \geq 0 \quad / - \frac{4}{5}$

$-x \geq -\frac{4}{5} \quad / \cdot (-1)$

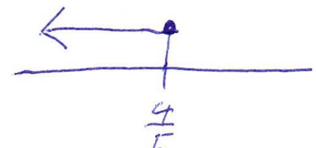
$x \leq \frac{4}{5}$

$\left(x - \frac{4}{5}\right) = 0$

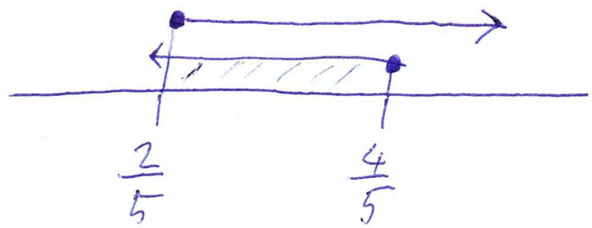
$x_0 = \frac{4}{5}$

	$(-\infty, \frac{4}{5})$	$(\frac{4}{5}, +\infty)$
$(x - \frac{4}{5})$	$-$	$+$
chceme	⊖	⊕

$\left(-\infty, \frac{4}{5}\right\rangle$



VÝSLEDEK:



$K \in \langle \frac{2}{5}, \frac{4}{5} \rangle$

$$y = \frac{2\cos(2x)}{4}$$

$$\Downarrow$$

$$y = \frac{1}{4} \cdot 2\cos(2x)$$

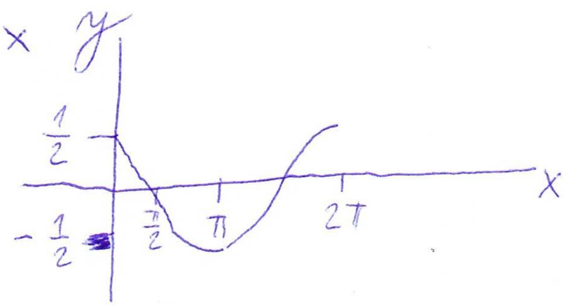
$$\Downarrow$$

$$y = \frac{2}{4}\cos(2x)$$

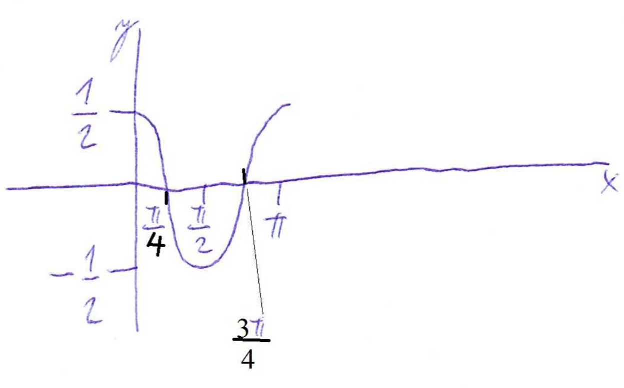
$$\Downarrow$$

$$y = \frac{1}{2}\cos(2x)$$

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



$\frac{1}{2}\cos(2x)$



$\frac{2\pi}{2} = \pi$ periodo

$$y = \log_3 x + 1$$

$$\log_3 x + 1 = 0 \quad /-1$$

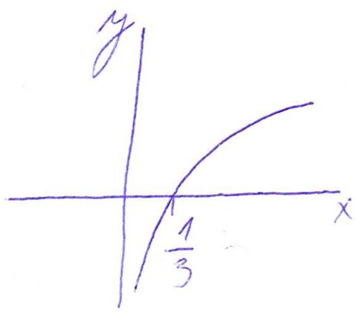
$$\log_3 x = -1$$

(Hledám, KDY SE $\log_3 x$ ROVNÁ -1)

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

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

$$x = \frac{1}{3}$$



$$y = -4x^2 - 8x$$

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

$$y = -4(x^2 + 2x + 1) - 1(-4)$$

$$y = -4(x + 1)^2 + 4$$

$V[-1, 4]$

"KONTROLA" DERIVACÍ

$$f' = (-4x^2 - 8x)'$$

$$f' = -8x - 8$$

$$-8x - 8 = 0 \quad /+8$$

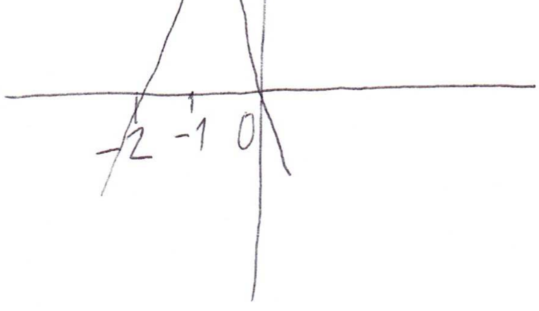
$$-8x = 8 \quad /:(-8)$$

$$x = -1$$

$$y = -4 \cdot (-1)^2 - 8 \cdot (-1)$$

$$y = -4 + 8$$

$$y = 4$$



$P_y = ?\ x = 0$

$$y = -4 \cdot 0^2 - 8 \cdot 0$$

$$y = 0$$

$P_y[0, 0]$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_{1,2} = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \cdot (-4) \cdot 0}}{2 \cdot (-4)}$$

$$x_{1,2} = \frac{8 \pm \sqrt{64}}{-8}$$

$$x_{1,2} = \frac{8 \pm 8}{-8} \quad x_1 = -2, \quad x_2 = 0$$

$$\left(\left(\frac{1}{16}\right)^{\frac{1}{4}} + 8^{-\frac{2}{3}}\right)^{-1} =$$

$$= \frac{1}{\left(\frac{1}{16}\right)^{-\frac{1}{4}} + \frac{1}{8^{\frac{2}{3}}}} =$$

$$= \frac{1}{\frac{\sqrt[4]{1}}{\sqrt[4]{16}} + \frac{1}{\sqrt[3]{64}}} =$$

$$= \frac{1}{\frac{1}{2} + \frac{1}{4}} =$$

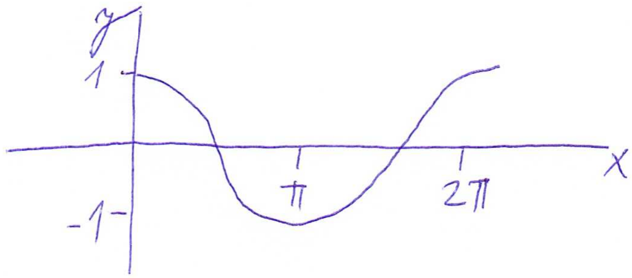
$$= \frac{1}{\frac{2+1}{4}} =$$

$$= \frac{1}{1} : \frac{3}{4} =$$

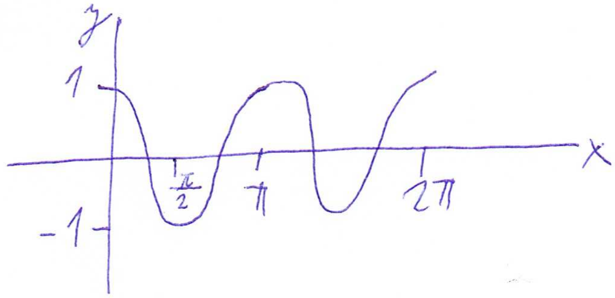
$$= \frac{1}{1} \cdot \frac{4}{3} = \underline{\underline{\frac{4}{3}}}$$

$2 - \cos 2x$

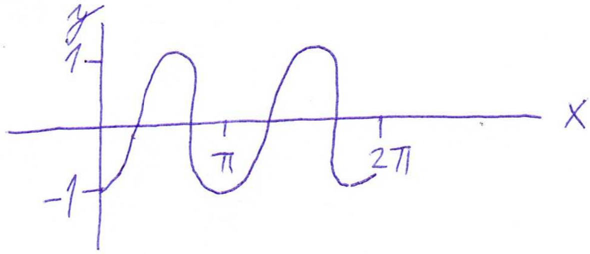
$\cos x$



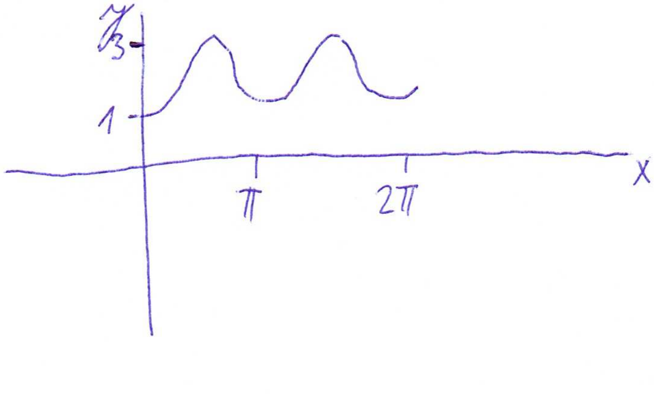
$\cos 2x$



$-\cos 2x$



$2-\cos 2x$



$$y = \boxed{2\cos\frac{x}{2}}$$

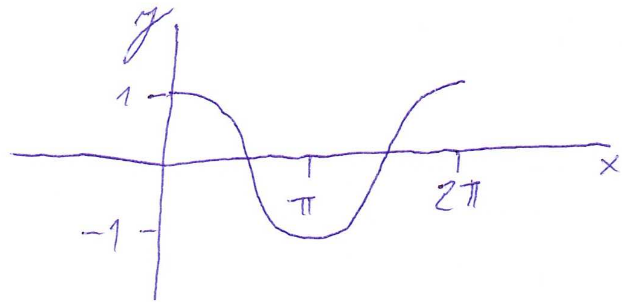
ovlivňuje amplitudu

$$\Downarrow$$

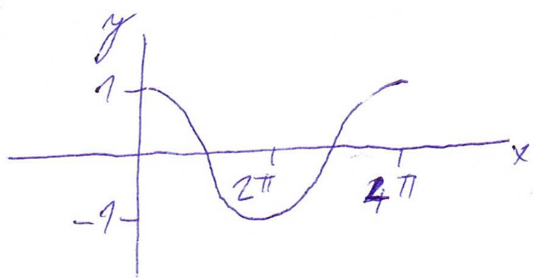
$$y = 2 \cdot \cos\frac{1}{2}x$$

$$\frac{2\pi}{1} : \frac{1}{2} = \frac{2\pi}{1} \cdot \frac{2}{1} = 4\pi$$

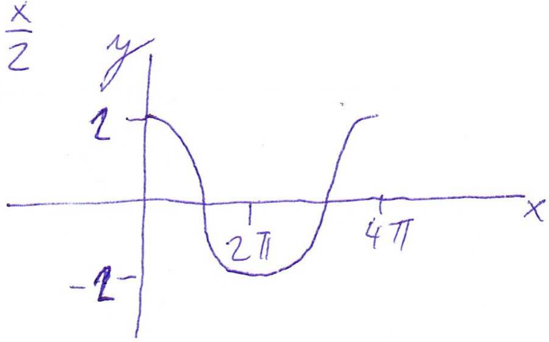
$y = \cos x$



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



$y = 2\cos\frac{x}{2}$



$$y = \frac{4\cos(2x)}{2}$$

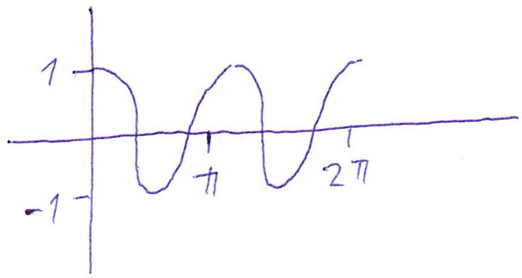
$$\Downarrow$$

$$y = 2\cos(2x)$$

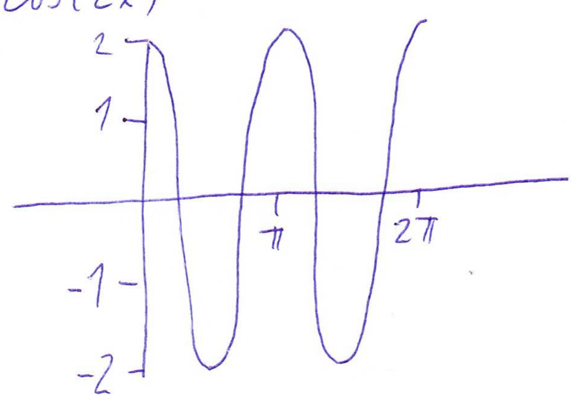
vzor

$$\frac{2\pi}{1} : \frac{2}{1} = \frac{2\pi}{1} \cdot \frac{1}{2} = \frac{2\pi}{2} = \pi$$

$\cos(2x)$



$2\cos(2x)$



MROCZKOWSKI MILAN
YESIT.CZ

YESIT.CZ
MILAN MRACZKOWSKI

$$\frac{\overbrace{\sqrt{\frac{1+x}{1-x}}}^{a}+\overbrace{\sqrt{\frac{1-x}{1+x}}}^{b}}{\underbrace{\sqrt{\frac{1+x}{1-x}}}_{a}-\underbrace{\sqrt{\frac{1-x}{1+x}}}_{b}}\cdot\frac{\sqrt{\frac{1+x}{1-x}}+\sqrt{\frac{1-x}{1+x}}}{\sqrt{\frac{1+x}{1-x}}+\sqrt{\frac{1-x}{1+x}}}=$$

$$=\frac{\frac{1+x}{1-x}+\sqrt{\frac{1+x}{1-x}}\sqrt{\frac{1-x}{1+x}}+\sqrt{\frac{1-x}{1+x}}\sqrt{\frac{1+x}{1-x}}+\frac{1-x}{1+x}}{\frac{1+x}{1-x}+\sqrt{\frac{1+x}{1-x}}\sqrt{\frac{1-x}{1+x}}-\sqrt{\frac{1-x}{1+x}}\sqrt{\frac{1+x}{1-x}}-\frac{1-x}{1+x}}=$$

$$=\frac{\frac{1+x}{1-x}+2\left(\sqrt{\frac{1+x}{1-x}}\sqrt{\frac{1-x}{1+x}}\right)+\frac{1-x}{1+x}}{\frac{1+x}{1-x}-\frac{1-x}{1+x}}=$$

$$=\frac{\frac{1+x}{1-x}+2\sqrt{\frac{(1+x)(1-x)}{(1-x)(1+x)}}+\frac{1-x}{1+x}}{\frac{1+x}{1-x}-\frac{1-x}{1+x}}=\frac{\frac{1+x}{1-x}+2+\frac{1-x}{1+x}}{\frac{(1+x)(1+x)-(1-x)(1-x)}{(1-x)(1+x)}}=$$

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

$$=\frac{\frac{(1+x)^2+2(1-x^2)+(1-x)^2}{1-x^2}}{\frac{4x}{1-x^2}}=\frac{(1+x)^2+2(1-x^2)+(1-x)^2}{4x}=$$

$$=\frac{1+2x+x^2+2-2x^2+1-2x+x^2}{4x}=\frac{4}{4x}=\frac{1}{x}$$

$x\neq 0,\ x\neq 1,\ x\neq -1$

$$\left(\frac{1+\frac{1}{x}}{x-1}-\frac{1}{x}\right):\frac{1+x}{x}=$$

$$=\frac{x+1-(x-1)}{(x-1)\,x}\cdot\frac{x}{1+x}=$$

$$=\frac{x+1-x+1}{(x-1)\,x}\cdot\frac{x}{1+x}=$$

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

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

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

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

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

$x \neq -1$
$x \neq 0$
$x \neq 1$

$$3^x = 27$$

$$3^x = 3^3$$

$$x = 3$$

$$\log_3 3^x = \log_3 27$$

$$\log_3 3^x = \log_3 3^3$$

$$x = 3$$

KALKULAČKA

$$\frac{\log 27}{\log 3}$$

$$\log_{\frac{1}{4}} x = 2$$

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

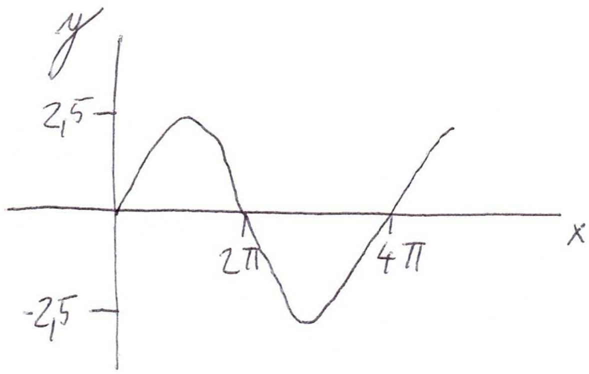
$$\left(\frac{1}{16}\right) = x$$

$$\frac{1}{16} = x$$

WOLFRAMALPHA.COM:

log(1/4, x) = 2

$$y = 2{,}5 \cdot \sin\left(\frac{x}{2}\right) \Rightarrow y = 2{,}5 \cdot \sin \frac{1}{2} x$$



$$\frac{2\pi}{1} : \frac{1}{2} = \frac{2\pi}{1} \cdot \frac{2}{1} = 4\pi$$

$$y = 2{,}5 \cdot \sin\left(\frac{x}{2} + \frac{\pi}{6}\right)$$

$$\frac{x}{2} + \frac{\pi}{6} = 0$$

$$x\frac{1}{2} + \frac{\pi}{6} = 0 \quad / - \frac{\pi}{6}$$

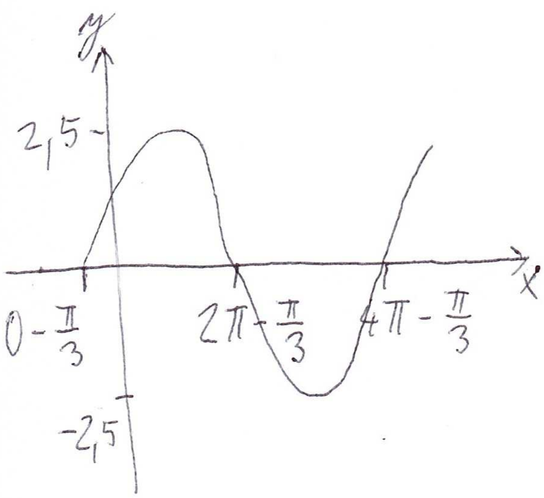
$$x\frac{1}{2} = -\frac{\pi}{6}$$

$$\frac{1}{2}x = -\frac{\pi}{6} \quad / : \frac{1}{2}$$

$$x = -\frac{\pi}{6} \cdot \frac{2}{1}$$

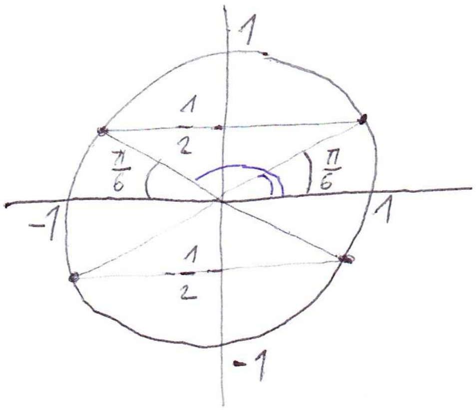
$$x = -\frac{2\pi}{6}$$

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



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

$y = x$ Pozn.: sin y = 1/2



NAJDU V TABULCE $\frac{1}{2}$ A ZJISTÍM: $\frac{\pi}{6}$ rad

(NAJDU NA KALKULAČCE
- PŘEPNU DO REŽIMU RAD
SHIFT SIN $\frac{1}{2}$)

$$\frac{\pi}{1} - \frac{\pi}{6} = \frac{6\pi - \pi}{6} = \frac{5\pi}{6}$$

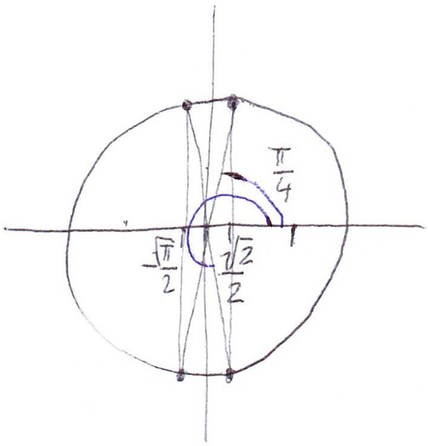
$$\frac{\pi}{6}$$

$$x_1 = \frac{\pi}{6} + k \cdot 2\pi \qquad x_2 = \frac{5\pi}{6} + k \cdot 2\pi$$

$$K = \left\{ \frac{\pi}{6} + k \cdot 2\pi ; \frac{5\pi}{6} + k \cdot 2\pi \right\}$$

$$\cos 2x = \frac{\sqrt{2}}{2}$$

$$2x = y \qquad \cos y = \frac{\sqrt{2}}{2}$$



$$\frac{\pi}{4}$$

$$\frac{2\pi}{1} - \frac{\pi}{4} = \frac{8\pi - \pi}{4} = \frac{7\pi}{4}$$

$$2x_1 = \frac{\pi}{4} + k \cdot 2\pi \quad /:2 \qquad 2x_2 = \frac{7\pi}{4} + k \cdot 2\pi \quad /:2$$

$$x_1 = \frac{\pi}{8} \cdot k\pi \qquad x_2 = \frac{7\pi}{8} \cdot k\pi$$

$$K = \left\{ \frac{\pi}{8} \cdot k\pi \, , \, \frac{7\pi}{8} \cdot k\pi \right\}$$