44) $C = 2x + \dfrac{300000}{x}$

$C = 2x + 300000x^{-1}$

$C' = 2 - 30000x^{-2} = 0$

$x^2 \left(2 - \dfrac{300000}{x^2} = 0 \right)$

$2x^2 - 300000 = 0$

$2x^2 = 300000$

$x^2 = 150000$

$x = \sqrt{150000} = 387$

$C(1) = 2 \cdot 1 + \dfrac{300000}{1} = 300{,}002$

$C(300) = 2 \cdot 300 + \dfrac{300000}{300}$

$= 600 + 1000$

$= \$1600$

$\boxed{300}$

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$f(x) = 2x^3 + 3x^2 - 12x$

$f'(x) = 6x^2 + 6x - 12 = 0$
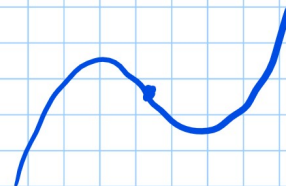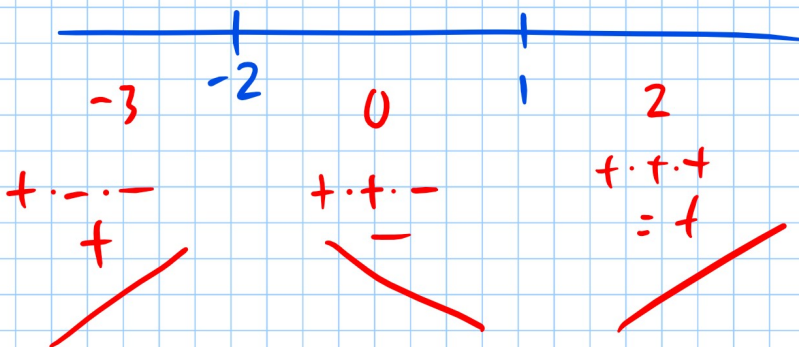
$6(x^2 + x - 2) = 0$

$6(x+2)(x-1) = 0$

$x = -2 \quad x = 1$

rel max @ $(-2, f(-2))$
$= (-2, 20)$

rel min @ $(1, f(1))$
$= (1, -7)$

30) $f(x) = \sin x \cos x$

$f'(x) = \sin x(-\sin x) + \cos x \cdot \cos x$
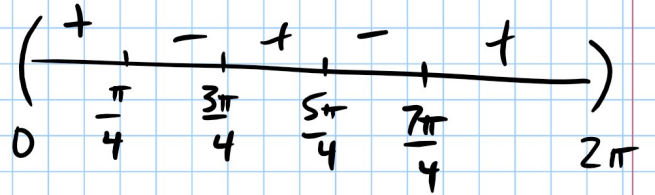
$\qquad = -\sin^2 x + \cos^2 x$

$\qquad = -\sin^2 x + 1 - \sin^2 x$

$\qquad = 1 - 2\sin^2 x = 0$

$-2\sin^2 x = -1$

$\sin^2 x = \dfrac{1}{2}$

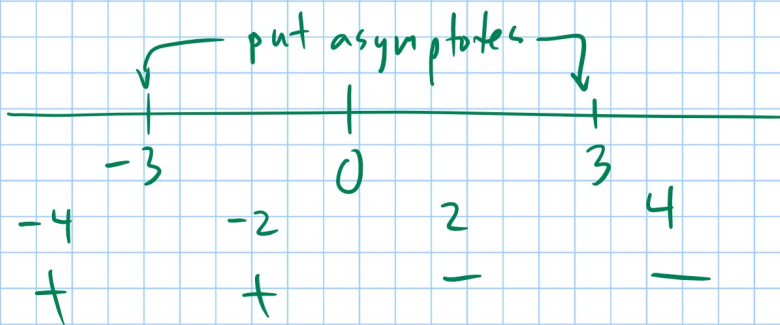$\sin x = \pm\sqrt{\dfrac{1}{2} \cdot \dfrac{\sqrt{2}}{\sqrt{2}}} = \pm\dfrac{\sqrt{2}}{2}$

$\sin^2 x + \cos^2 x = 1$

$\cos^2 x = 1 - \sin^2 x$

$$\left(\overset{+}{\underset{0}{\rule{0pt}{1em}}} \quad \overset{-}{\underset{\frac{\pi}{4}}{\rule{0pt}{1em}}} \quad \overset{+}{\underset{\frac{3\pi}{4}}{\rule{0pt}{1em}}} \quad \overset{-}{\underset{\frac{5\pi}{4}}{\rule{0pt}{1em}}} \quad \overset{+}{\underset{\frac{7\pi}{4}}{\rule{0pt}{1em}}} \quad \underset{2\pi}{\rule{0pt}{1em}} \right)$$

maxima @ $\left(\frac{\pi}{4}, 0.5\right), \left(\frac{5\pi}{4}, 0.5\right)$

minima @ $\left(\frac{3\pi}{4}, -0.5\right), \left(\frac{7\pi}{4}, -0.5\right)$

19) $f(x) = \dfrac{x^2}{x^2 - 9}$ $\qquad x \neq 3, -3 \longrightarrow$ Vertical Asymptotes

$f'(x) = \dfrac{(x^2-9)2x - x^2(2x)}{(x^2-9)^2} = \dfrac{2x^3 - 18x - 2x^3}{(x^2-9)^2} = \dfrac{-18x}{(x^2-9)^2}$

put asymptotes

$$\begin{array}{ccccc} & -3 & 0 & 3 & \\ -4 & -2 & 2 & 4 & \\ + & + & - & - & \end{array}$$

max @ $(0, f(0))$

$\qquad = (0, 0)$

48) $C = \dfrac{3t}{27 + t^3}$

$$C' = \frac{(27+t^3)3 - 3t(3t^2)}{(27+t^3)} = \frac{81 + 3t^3 - 9t^3}{(27+t^3)}$$

$$= 81 - 6t^3 = 0$$

$$-6t^3 = -81$$

$$t^3 = \frac{81}{6} = \frac{27}{2}$$

$$t = \sqrt[3]{\frac{27}{2}}$$

$$t = 2.4$$