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1. $f(x) = \begin{cases} 3x-1 & ; x \geq 2 \\ x^2+1 & ; x < 2 \end{cases}$

a.) ① $f(2) = 3(2)-1 = 5$

② $\lim_{x \to 2^-} 3(2)-1 = 5$

$\lim_{x \to 2^+} 2^2+1 = 5$

$\Big\} \lim_{x \to 2} f(x) = 5$

③ $\lim_{x \to 2} f(x) = f(2) = 5$

∴ kontinu di $x = 2$

b.) $\lim_{x \to 2^+} \frac{3x-1-5}{x-2}$

$\lim_{x \to 2^+} \frac{3x-6}{x-2}$

$\lim_{x \to 2^+} \frac{3(x-2)}{x-2}$

$\lim_{x \to 2^+} 3$

$= 3$

$\lim_{x \to 2^-} \frac{x^2+1-5}{x-2}$

$\lim_{x \to 2^-} \frac{x^2-4}{x-2}$

$\lim_{x \to 2^-} \frac{(x+2)(x-2)}{x-2}$

$\lim_{x \to 2^-} x-2$

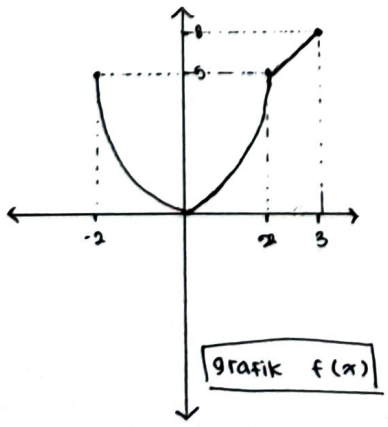
$\lim_{x \to 2^-} 4$

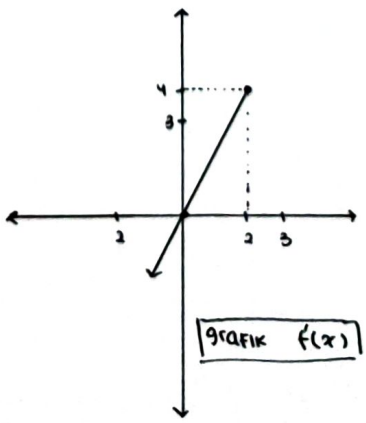
$= 4$

∴ $f(x)$ tidak diferensiabel

c.) $f'(x) = \begin{cases} \frac{d\ 3x-1}{dx} = 3 & ; x \geq 2 \\ \frac{d\ x^2+1}{dx} = 2x & ; x < 2 \end{cases}$

d.)





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2. Hiperbola E $xy = \sqrt{2}$

Hiperbola F $x^2 - y^2 = 1$

a.) $xy = \sqrt{2}$

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

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

$x^2 - y^2 = 1$

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

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

$(x^2-2)(x^2+1)$

$x = \pm\sqrt{2}$

saat $x = -\sqrt{2}$

$-\sqrt{2y} = \sqrt{2}$

$y = -1$

$P = (-\sqrt{2}, -1)$

saat $x = \sqrt{2}$

$\sqrt{2y} = \sqrt{2}$

$y = 1$

$Q = (\sqrt{2}, 1)$

b.) $m_E = \frac{d(xy)}{dx} = \frac{d(\sqrt{2})}{dx}$

$y + x\frac{dy}{dx} = 0$

$\frac{dy}{dx} = \frac{-y}{x}$

$m_F = \frac{d(x^2-y^2)}{dx} = \frac{d(1)}{d(x)}$

$2x - 2y\frac{dy}{dx} = 0$

$\frac{dx}{dy} = \frac{x}{y}$

$m_E \cdot m_F = -\frac{y}{x} \cdot \frac{x}{y}$

$= -1$ (tegak lurus)

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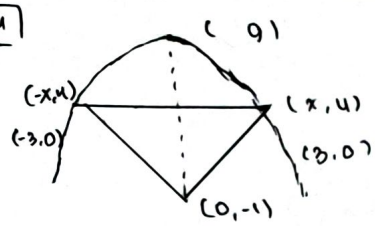
4.



$t = |y - (-1)|$

$t = y + 1$

$t = 10 - \frac{10}{3}$

$a = x - (-x)$

$= 2x$

$\therefore a = 2\sqrt{\frac{10}{3}}$

$t = 10 - \frac{10}{3}$

$= \frac{27 - 10}{3} = \frac{17}{3}$

$L_\Delta = \frac{1}{2} \cdot a.t$

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

$L_\square = x(y+1)$

$= x(9 - x^2 + 1)$

$= x(10 - x^2)$

$= 10x - x^3$

$L' = 10 - 3x^2$

$L' = 0$

$10 = 3x^2$

$\frac{10}{3} = x^2$

$x = \sqrt{\frac{10}{3}}$

$\therefore L_{maks} = \frac{1}{2} \cdot a \cdot t$

$= \frac{1}{2} \cdot \sqrt{\frac{10}{3}} \cdot \frac{17}{3}$

$= \frac{\sqrt{30}}{3} \cdot \frac{17}{3}$

$= \frac{17\sqrt{30}}{9}$ //

3. $f(x) = \frac{5x}{x+2}$

a.) asimtot

↳ tegak

$\lim_{x \to -2} \frac{5x}{x+2} = \infty$

maka $x = -2$

datar

$\lim_{x \to \infty} \frac{5x}{x+2}$

$\lim_{x \to \infty} \frac{\frac{5x}{x}}{\frac{x}{x} + \frac{2}{x}}$

$= \frac{5}{1+0}$

$= 5$

$\therefore$ asimtot

tegak $= -2$ || $x = -2$

datar $= 5$ || $y = 5$

b.) ∵ stationer

$f'(x) = 0$

$\frac{5(x+2) - 5x(1)}{(x+2)^2} = 0$

$\frac{5x + 10 - 5x}{(x+2)^2} = 0$

$\frac{10}{(x+2)^2} = 0, \; x \neq 2$

↳ tidak ada

∵ Titik belok

$\frac{0 - 10(2(x+2) - 1)}{(x+2)^4} = 0$

$\frac{0 - 20x + 40}{(x+2,4} = 0$

$\frac{-20}{(x+2)^4} = 0$ → tidak ada

5. a.) $F\left(\frac{\pi}{4}\right) \Rightarrow \int_{\frac{\pi}{4}}^{\frac{\pi}{4}} \left(\frac{\sin t}{1 + \cos t}\right) dt = 0$

b.) $F'\left(\frac{\pi}{4}\right) \Rightarrow \frac{\sin(\pi/4)}{1 + \cos(\pi/4)} = \frac{\frac{1}{2}\sqrt{2}}{1 + \frac{1}{2}\sqrt{2}} = \frac{\frac{1}{2}\sqrt{2}}{\frac{2}{2} + \frac{1}{2}\sqrt{2}} = \frac{\sqrt{2}}{x} \cdot \frac{x}{2+\sqrt{2}} = \frac{\sqrt{2}}{2+\sqrt{2}}$

c.) $F''\left(\frac{\pi}{4}\right) \Rightarrow \frac{(\cos t)(1 + \cos t) - (\sin t)(-\sin t)}{(1 + \cos t)^2}$

$= \frac{\cos t + \cos^2 t + \sin^2 t}{(1 + \cos t)^2}$

$= \frac{\cos t + 1}{(1 + \cos t)^{x^1}} = \frac{1}{1 + \cos t}$

$= \frac{1}{1 + \cos(\pi/4)} = \frac{1}{1 + \frac{1}{2}\sqrt{2}} = \frac{1}{\frac{2}{2} + \frac{1}{2}\sqrt{2}} = \frac{2}{2 + \sqrt{2}}$ //

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3. grafik