

1. $f(x) = 3x^4 - 8x^3 + 10$

a. $f'(x) = 12x^3 - 24x^2$

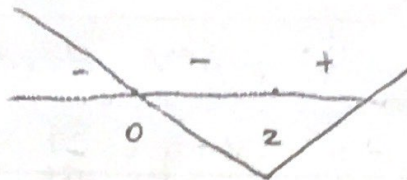
$f''(x) = 36x^2 - 48x$

$f'(x) = 0$

$0 = 12x^3 - 24x^2$

$0 = 12x^2(x-2)$

$x = 0 \vee x = 2$



fungsi naik = $[2, \infty]$

fungsi turun = $[-\infty, 0] \cup [0, 2]$

b. tidak ada lokal maximum/minimum

c. tidak ada global max, hanya ada min global di $x = 2$

d. $f''(2) = 48$, $2 =$ titik minimum

$f''(0) = 0$, $0 =$ titik belok

$f''(1) = -12$, f cekung ke bawah di $[-\infty, 0]$

$f''(-1) = 84$, f cekung ke atas di $[0, 2]$

$f''(3) = 180$, f cekung ke atas di $[2, \infty]$

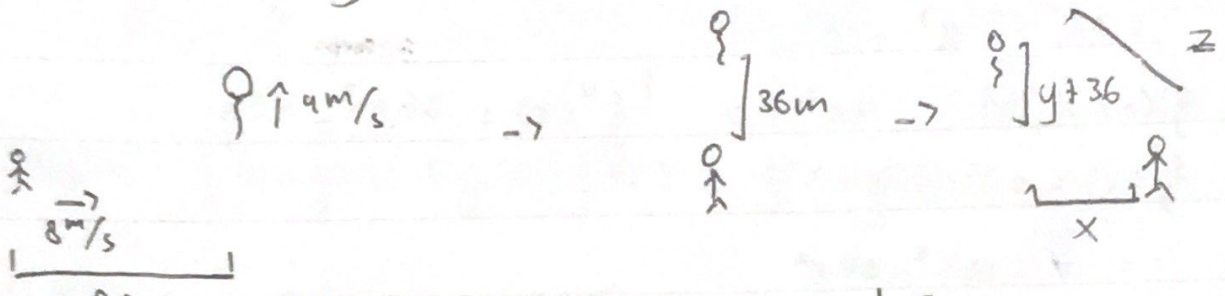
e. $\lim_{x \rightarrow \infty} 3x^4 - 8x^3 + 10 = \infty (3)$

$= \infty$ membesar mendekati tak hingga untuk $x \rightarrow \infty$

$\lim_{x \rightarrow -\infty} 3x^4 - 8x^3 + 10 = \infty (3)$

$= \infty$ membesar mendekati tak hingga untuk $x \rightarrow -\infty$

2.



$\frac{dx}{dt} = 8$ $\frac{dy}{dt} = 4$ $t = 3$ | arah = kecepatan \times waktu

$$x = \frac{dx}{dt} \cdot t$$

$$x = 8 \cdot 3$$

$$x = 24 \text{ m}$$

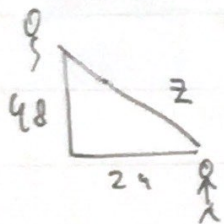
$$y = \frac{dy}{dt} \cdot t$$

$$y = 4 \cdot 3$$

$$y = 12$$

$$y_{\text{total}} = 12 + 36$$

$$= 48 \text{ m}$$



$$z^2 = x^2 + y_{\text{total}}^2$$

$$z = \sqrt{24 \cdot 24 + 48 \cdot 48}$$

$$z = \sqrt{576 + 2304}$$

$$z = \sqrt{2880}$$

$$z = 24\sqrt{5}$$

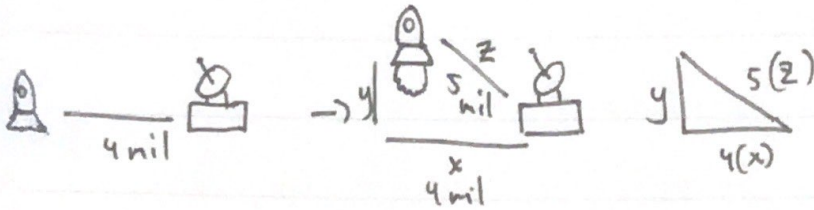
\therefore Jarak balon ke arah saat waktu = 3 adalah $24\sqrt{5}$ m

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3.



$$z = 5 \text{ mil}$$

$$x = 4 \text{ mil}$$

$$\frac{dz}{dt} = 3600 \text{ mil/jam}$$

$$\frac{dx}{dt} = 0$$

$$x^2 + y^2 = z^2$$

$$y^2 = z^2 - x^2$$

$$y = \sqrt{25 - 16}$$

$$y = 3$$

$$x^2 + y^2 = z^2$$

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2z \frac{dz}{dt}$$


$$4 \cdot 0 + 3 \cdot \frac{dy}{dt} = 5 \cdot 3600$$

$$\frac{dy}{dt} = 5 \cdot 1200$$

$$= 6000 \text{ mil/jam}$$

\therefore Kecepatan vertikal roket adalah 6000 mil/jam

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4.  rusuk = 8 rusuk ^{atas} bawah (rusuk persegi) = x
= 4 rusuk samping (rusuk ^{persegi} panjang) = y

$$\text{volume} = x \cdot x \cdot y$$

$$13500 = x^2 y \rightarrow y = \frac{13500}{x^2}$$

$$\text{rusuk minimum} = f'(x) = 2xy + x^2$$

$$\text{Luas balok} = L(x)$$

$$L(x) = 4(xy) + (x \cdot x)$$

$$= 4\left(x \cdot \frac{13500}{x^2}\right) + x^2$$

$$= \frac{54000}{x} + x^2$$

$$L'(x) = 0 \text{ untuk minimum}$$

$$0 = -54000 \cdot x^{-2} + 2x$$

$$2x = 54000 x^{-2}$$

$$x^3 = 27000$$

$$x = 30, \text{ 1 rusuk persegi} = 30 \text{ cm},$$

$$y = \frac{13500}{900} = 15, \text{ 1 rusuk samping/bediri} = 15 \text{ cm},$$

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$$5. P(t) = 10 \cdot 4^{t \cdot 4}, \quad t = 1 \text{ jam}$$

$$a. t = 3$$

$$P(0) = 10 \cdot 4^{0 \cdot 4} = 10$$

$$P(3) = 10 \cdot 4^{3 \cdot 4}$$

$$= 10 \cdot 4^{12}$$

$$= 167.772.160$$

$$b. P(3) = 9 \text{ digit}$$

$$10 \text{ digit} = P(3) \cdot 4^2$$

$$2.684.354.560 = 10 \cdot 4^{12} \cdot 4^2$$

$$= 10 \cdot 4^{14}$$

$$= 10 \cdot 4^{3,5 \cdot 4}$$

$$t = 3,5 \text{ jam}$$

$$= 3,5 \times 60 \text{ menit}$$

$$= 210 \text{ menit,,}$$