

TINGKATAN 5

BAB 2

Uji Diri 1

$$1 \text{ (a) } \lim_{x \rightarrow 2} \frac{1 - 6x^2}{x + 1} = \frac{1 - 6(2)^2}{2 + 1} \\ = \frac{1 - 6(4)}{3} \\ = -\frac{23}{3}$$

$$\text{(b) } \lim_{x \rightarrow 1} \frac{2x - 2}{x^2 + 1} = \lim_{x \rightarrow 1} \frac{2(x - 1)}{(x - 1)(x + 1)} \\ = \lim_{x \rightarrow 1} \frac{2}{x + 1} \\ = \frac{2}{1 + 1} \\ = 1$$

$$2 \text{ } y = 8x + 5$$

$$\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} \frac{[8(x + \delta x) + 5] - (8x + 5)}{\delta x} \\ = \lim_{\delta x \rightarrow 0} \frac{8x + 8\delta x + 5 - 8x - 5}{\delta x} \\ = \lim_{\delta x \rightarrow 0} 8 \\ = 8$$

$$\text{(a) } y = \frac{2}{3x} \dots\dots\dots ①$$

$$y + \delta y = \frac{2}{3(x + \delta x)} \dots\dots\dots ②$$

$$② - ① :$$

$$\delta y = \frac{2}{3(x + \delta x)} - \frac{2}{3x} \\ = \frac{6x - 2(3x + 3\delta x)}{3x(3x + 3\delta x)} \\ = \frac{-6\delta x}{9x^2 + 9x\delta x}$$

$$\frac{\delta y}{\delta x} = \frac{-6}{9x^2 + 9x\delta x}$$

$$\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} \frac{-6}{9x^2 + 9x\delta x} \\ = -\frac{6}{9x^2} \\ = -\frac{2}{3x^2}$$

$$\text{(b) } y = 2(1 - x^2)$$

$$y = 2 - 2x^2 \dots\dots\dots ①$$

$$y + \delta y = 2 - 2(x + \delta x)^2 \\ = 2 - 2(x^2 + 2x\delta x + (\delta x)^2)$$

$$y + \delta y = 2 - 2x^2 - 4x\delta x - 2(\delta x)^2 \dots\dots\dots ②$$

$$② - ① :$$

$$\delta y = -4x\delta x - 2(\delta x)^2$$

$$\frac{\delta y}{\delta x} = -4x - 2\delta x$$

$$\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} -4x - 2\delta x \\ = -4x$$

Uji Diri 2

$$1 \text{ (a) } y = 2x^4 + 3x^3 - 8x \\ \frac{dy}{dx} = 2(4x^3) + 3(3x^2) - 8 \\ = 8x^3 + 9x^2 - 8$$

$$\text{(b) } y = 2(3x + 1)(x - 2) \\ = 2(3x^2 - 5x - 2) \\ = 6x^2 - 10x - 4 \\ \frac{dy}{dx} = 12x - 10$$

$$\text{(c) } y = \frac{3x(1 - x)}{2x - 1} \\ = \frac{3x - 3x^2}{2x - 1} \\ \frac{dy}{dx} = \frac{(3 - 6x)(2x - 1) - 2(3x - 3x^2)}{(2x - 1)^2} \\ = \frac{6x - 3 - 12x^2 + 6x - 6x + 6x^2}{(2x - 1)^2} \\ = \frac{6x - 3 - 6x^2}{(2x - 1)^2} \\ = \frac{3(2x - 2x^2 - 1)}{(2x - 1)^2}$$

$$\text{(d) } y = (3x + 4)^2(2x + 3) \\ \frac{dy}{dx} = 2(3x + 4)(3)(2x + 3) + 2(3x + 4)^2 \\ = 6(3x + 4)(2x + 3) + 2(3x + 4)^2 \\ = 2(3x + 4)[3(2x + 3) + (3x + 4)] \\ = 2(3x + 4)(6x + 9 + 3x + 4) \\ = 2(3x + 4)(9x + 13)$$

$$2 \text{ } f(x) = (x + 3)^2 - 5(x + 1) \\ f'(x) = 2(x + 3)(1) - 5(1) \\ = 2x + 6 - 5 \\ = 2x + 1 \\ f'(1) = 2(1) + 1 = 3$$

$$3 \text{ } f(t) = \frac{(t^2 + 6)^2}{t}, f'(t) = -21 \\ f'(t) = \frac{2(t^2 + 6)(2t)(t) - 1(t^2 + 6)^2}{t^2} \\ = \frac{4t^2(t^2 + 6) - (t^2 + 6)^2}{t^2} \\ = \frac{(t^2 + 6)[4t^2 - (t^2 + 6)]}{t^2} \\ = \frac{(t^2 + 6)(3t^2 - 6)}{t^2} \\ = \frac{3t^4 + 12t^2 - 36}{t^2} \\ f'(t) = -21$$

$$3t^4 + 12t^2 - 36 = -21t^2 \\ 3t^4 + 33t^2 - 36 = 0 \\ t^4 + 11t^2 - 12 = 0 \\ (t^2 - 1)(t^2 + 12) = 0 \\ t^2 = -12 \text{ (tidak tertakrif)} \\ \therefore t^2 = 1 \Rightarrow t = -1, t = 1$$

$$4 \text{ } y = 3t - \frac{2}{t}, \quad 2x + t = 1 \\ t = 1 - 2x$$

$$\begin{aligned} \text{(a)} \quad \frac{dy}{dt} &= 3 + \frac{2}{t^2}, \quad \frac{dt}{dx} = -2 \\ \frac{dy}{dx} &= \frac{dy}{dt} \times \frac{dt}{dx} \\ &= \left(3 + \frac{2}{t^2}\right)(-2) \\ &= -6 - \frac{4}{t^2} \\ &= -6 - \frac{4}{(1-2x)^2} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad t &= 2, 1-2x = 2 \\ 2x &= -1 \\ x &= -\frac{1}{2} \\ \frac{dy}{dx} &= -6 - \frac{4}{\left[1-2\left(-\frac{1}{2}\right)\right]^2} \\ &= -6 - \frac{4}{2^2} \\ &= -7 \end{aligned}$$

Uji Diri 3

$$\begin{aligned} 1 \quad s &= \frac{2t^3 - t}{3t^2} \\ &= \frac{2t^3}{3t^2} - \frac{t}{3t^2} \\ &= \frac{2}{3}t - \frac{1}{3t} \\ &= \frac{2}{3}t - \frac{1}{3}t^{-1} \\ \frac{ds}{dt} &= \frac{2}{3} + \frac{1}{3}t^{-2} \\ \frac{d^2s}{dt^2} &= -\frac{2}{3}t^{-3} \\ &= -\frac{2}{3t^3} \end{aligned}$$

$$\begin{aligned} 2 \quad f(x) &= \frac{3x^2}{2x+5} \\ f'(x) &= \frac{6x(2x+5) - 2(3x^2)}{(2x+5)^2} \\ &= \frac{12x^2 + 30x - 6x^2}{(2x+5)^2} \\ &= \frac{6x^2 + 30x}{(2x+5)^2} \\ f''(x) &= \frac{(12x+30)(2x+5)^2 - 2(2x+5)(6x^2+30x)}{(2x+5)^4} \\ &= \frac{(12x+30)(2x+5)^2 - 4(2x+5)(6x^2+30x)}{(2x+5)^4} \\ &= \frac{(2x+5)[(12x+30)(2x+5) - 4(6x^2+30x)]}{(2x+5)^4} \\ &= \frac{(12x+30)(2x+5) - 4(6x^2+30x)}{(2x+5)^3} \\ f''(-2) &= \frac{(-24+30)(-4+5) - 4(24-60)}{[2(-2)+5]^3} \\ &= \frac{6-4(-36)}{1^3} \\ &= 150 \end{aligned}$$

$$\begin{aligned} 3 \quad y &= -\frac{4}{x^2} + 2x - 1 = -4x^{-2} + 2x - 1 \\ \frac{dy}{dx} &= 8x^{-3} + 2 \\ \frac{d^2y}{dx^2} &= -24x^{-4} = -\frac{24}{x^4} \\ x &= 2, \quad \frac{d^2y}{dx^2} = -\frac{24}{2^4} \\ &= -\frac{3}{2} \end{aligned}$$

Uji Diri 4

$$1 \quad f(x) = 3x^2 + 5ax - 12$$

$$m_{\text{normal}} = \frac{1}{3} \Rightarrow m_{\text{tangen}} = -3$$

$$f'(x) = 6x + 5a$$

$$f'(2) = 6(2) + 5a$$

$$-3 = 12 + 5a$$

$$5a = -15$$

$$a = -3$$

$$\therefore f(x) = 3x^2 - 15x - 12$$

$$f(2) = 3(2)^2 - 15(2) - 12$$

$$= -30$$

$$\begin{aligned} \text{Persamaan tangen: } \frac{y+30}{x-2} &= -3 \\ y+30 &= -3x+6 \\ y &= -3x-24 \end{aligned}$$

$$2 \quad y = ax^2 + bx$$

$$\text{(a)} \quad \frac{dy}{dx} = 2ax + b$$

$$x = 1, \quad \frac{dy}{dx} = 2a(1) + b$$

$$2 = 2a + b \dots\dots ①$$

$$(1, -3), \quad -3 = a(1)^2 + b(1)$$

$$a + b = -3 \dots\dots ②$$

$$① - ②: a = 5$$

$$b = -3 - a = -8$$

$$\text{(b)} \quad \frac{dy}{dx} = 2(5)x + (-8)$$

$$= 10x - 8$$

$$\text{Titik pegun: } \frac{dy}{dx} = 0$$

$$10x - 8 = 0$$

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

$$y = 5x^2 - 8x$$

$$\begin{aligned} x &= \frac{4}{5}, \quad y = 5\left(\frac{4}{5}\right)^2 - 8\left(\frac{4}{5}\right) \\ &= -\frac{16}{5} \end{aligned}$$

$$\text{Maka, titik pegun ialah } \left(\frac{4}{5}, -\frac{16}{5}\right)$$

$$\frac{d^2y}{dx^2} = 10 > 0$$

$$\therefore \left(\frac{4}{5}, -\frac{16}{5}\right) \text{ ialah titik minimum}$$

$$3 \quad s = 147t - 4.9t^2$$

$$\text{(a)} \quad \frac{ds}{dt} = 147 - 9.8t$$

$$\text{Titik maksimum: } 147 - 9.8t = 0$$

$$9.8t = 147$$

$$t = 15 \text{ saat}$$

$$\text{(b) Ketinggian maksimum,}$$

$$s = 147(15) - 4.9(15)^2$$

$$= 1102.5 \text{ meter}$$

$$4 \quad \text{(a)} \quad AC^2 = AB^2 + BC^2$$

$$y^2 = x^2 + 1$$

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

$$\text{(b)} \quad \frac{dy}{dx} = \frac{1}{2}(x^2 + 1)^{-\frac{1}{2}}(2x)$$

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

$$x = 6, \quad \frac{dy}{dx} = \frac{6}{\sqrt{37}}$$

$$\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt}$$

$$= \frac{6}{\sqrt{37}} \times (-2)$$

$$= -1.97 \text{ m per saat}$$

$$5 \quad y = \frac{4}{(x+2)^2} = 4(x+2)^{-2}$$

$$\frac{dy}{dx} = -8(x+2)^{-3} (1)$$

$$= -\frac{8}{(x+2)^3}$$

$$x = 1, \quad \frac{dy}{dx} = -\frac{8}{(1+2)^3} = -\frac{8}{27}$$

$$(a) \quad y = \frac{4}{(2.99)^2} = \frac{4}{(2+0.99)^2}$$

$$x_i = 0.99, \quad x_0 = 1, \quad \delta x = -0.01$$

$$\delta y \approx \frac{dy}{dx} (\delta x)$$

$$= -\frac{8}{27} (-0.01)$$

$$= \frac{0.08}{27}$$

$$y_0 = \frac{4}{(1+2)^2} = \frac{4}{9}$$

$$y_1 = \frac{4}{9} + \frac{0.08}{27}$$

$$= \frac{12.08}{27}$$

$$= \frac{1 \ 208}{2 \ 700}$$

$$= \frac{302}{675}$$

$$(b) \quad y = \frac{4}{(3.03)^2} = \frac{4}{(2+1.03)^2}$$

$$x_i = 1.03, \quad x_0 = 1, \quad \delta x = 0.03$$

$$\delta y = -\frac{8}{27} (0.03)$$

$$= -\frac{0.24}{27}$$

$$y_1 = \frac{4}{9} + \left(-\frac{0.24}{27}\right)$$

$$= \frac{12 - 0.24}{27}$$

$$= \frac{11.76}{27}$$

$$= \frac{1 \ 176}{2 \ 700}$$

$$= \frac{98}{225}$$

Praktis SPM

Kertas 1

$$1 \quad f(x) = \frac{5}{\sqrt{2x-1}} = 5(2x-1)^{-\frac{1}{2}}$$

$$f'(x) = -\frac{5}{2} (2x-1)^{-\frac{3}{2}} (2)$$

$$= -5(2x-1)^{-\frac{3}{2}}$$

$$f'(1) = -5(1)^{-\frac{3}{2}} = -5$$

$$2 \quad s = 6x^2 + x, \quad t = 3 - x$$

$$\frac{ds}{dx} = 12x + 1$$

$$x = 3 - t \Rightarrow \frac{dx}{dt} = -1$$

$$\frac{ds}{dt} = \frac{ds}{dx} \times \frac{dx}{dt}$$

$$= (12x+1)(-1)$$

$$= -12x-1$$

$$= -12(3-t)-1$$

$$= -36+12t-1$$

$$= 12t-37$$

$$3 \quad y = (5-x)(2+x)^3$$

$$(a) \quad \text{Kecerunan lengkung} = \frac{dy}{dx}$$

$$\frac{dy}{dx} = (-1)(2+x)^3 + (5-x)(3)(2+x)^2$$

$$= -(2+x)^3 + (15-3x)(2+x)^2$$

$$x = -1, \quad \frac{dy}{dx} = -(2-1)^3 + (15+3)(2-1)^2$$

$$= 17$$

$$(b) \quad m_{\text{tangen}} = 17, \quad m_{\text{normal}} = -\frac{1}{17}$$

$$x = -1, \quad y = (5+1)(2-1)^3 = 6$$

$$\text{Persamaan normal: } \frac{y-6}{x+1} = -\frac{1}{17}$$

$$17y - 102 = -x - 1$$

$$17y + x = 101$$

$$4 \quad y = \frac{1}{5} (6x - x^2)$$

$$= \frac{6}{5}x - \frac{1}{5}x^2$$

$$\frac{dy}{dx} = \frac{6}{5} - \frac{2}{5}x$$

$$2 = \frac{6}{5} - \frac{2}{5}x$$

$$-\frac{2}{5}x = \frac{4}{5}$$

$$x = -2$$

$$y = \frac{1}{5} (-12 - 4) = -\frac{16}{5}$$

$$\therefore A \left(-2, -\frac{16}{5}\right)$$

$$5 \quad (a) \quad f(x) = 2x^3 + ax^2 - 24x + 1$$

$$f'(x) = 0$$

$$6x^2 + 2ax - 24 = 0$$

$$f'(-4) = 0$$

$$6(-4)^2 + 2(-4)a - 24 = 0$$

$$8a = 72$$

$$a = 9$$

$$(b) \quad y = 2(5x-2)^4$$

$$\frac{dy}{dx} = 8(5x-2)^3 (5)$$

$$= 40(5x-2)$$

$$\frac{d^2y}{dx^2} = 120(5x-2)^2 (5)$$

$$= 600(5x-2)^2$$

$$6 \quad y = ax^2 + bx + c$$

$$\frac{dy}{dx} = 2ax + b$$

$$x = -2, \quad \frac{dy}{dx} = 2a(-2) + b$$

$$0 = -4a + b$$

$$b = 4a \dots\dots ①$$

$$\begin{aligned}
 (-1, 5), \quad 5 &= a(-1)^2 + b(-1) + c \\
 5 &= a - b + c \\
 5 &= a - 4a + c \\
 3a &= c - 5 \dots \dots (2) \\
 (-2, 2), \quad 2 &= a(-2)^2 + b(-2) + c \\
 2 &= 4a - 2b + c \\
 2 &= a - 8a + c \\
 2 &= c - 4a \\
 c &= 4a + 2 \dots \dots (3)
 \end{aligned}$$

Gantikan (3) ke dalam (2),

$$\begin{aligned}
 3a &= 2 + 4a - 5 \\
 a &= 3 \\
 b &= 4a = 12 \\
 c &= 2 + 4(3) = 14
 \end{aligned}$$

7 (a) $pV = 500, \frac{dp}{dt} = -10, p = 20$

$$\begin{aligned}
 V &= 500 p^{-1} \\
 \frac{dV}{dp} &= -500 p^{-2} \\
 &= -\frac{500}{p^2} \\
 p = 20, \quad \frac{dV}{dp} &= -\frac{500}{(20)^2} \\
 &= -\frac{5}{4}
 \end{aligned}$$

$$\begin{aligned}
 \frac{dV}{dt} &= \frac{dV}{dp} \times \frac{dp}{dt} \\
 &= -\frac{5}{4}(-10) \\
 &= \frac{25}{2} \text{ unit/s}
 \end{aligned}$$

(b) $A = \pi j^2$

$$\begin{aligned}
 \frac{dA}{dj} &= 2\pi j \\
 j = 14, \quad \frac{dA}{dj} &= 2\pi(14) = 28\pi \\
 \frac{dA}{dt} &= \frac{dA}{dj} \times \frac{dj}{dt} \\
 &= 28\pi \times 0.55 \\
 &= 15.4\pi \text{ cm}^2/\text{s}
 \end{aligned}$$

8 $y = (3x - 4)^2$

$$\begin{aligned}
 \delta x &= 2 - p - 2 = -p \\
 \frac{dy}{dx} &= 2(3x - 4)(3) \\
 &= 6(3x - 4) \\
 x = 2, \quad \frac{dy}{dx} &= 6(6 - 4) = 12 \\
 \delta y &\approx \frac{dy}{dx}(\delta x) \\
 &= 12(-p) \\
 &= -12p
 \end{aligned}$$

9 $y = \frac{1}{x^3 - 1} = (x^3 - 1)^{-1}$

$$\begin{aligned}
 \frac{dy}{dx} &= -1(x^3 - 1)^{-2}(3x^2) \\
 &= -\frac{3x^2}{(x^3 - 1)^2} \\
 x = 2, \quad \frac{dy}{dx} &= -\frac{3(2)^2}{(2^3 - 1)^2} \\
 &= -\frac{12}{49} \\
 \frac{1}{2.1^3 - 1} &= y_0 + \delta y \\
 &= \frac{1}{7}
 \end{aligned}$$

$$\begin{aligned}
 \delta y &\approx \frac{dy}{dx}(\delta x) \\
 &= -\frac{12}{49}(0.1) \\
 &= -\frac{12}{490} \\
 &= -\frac{6}{245} \\
 \therefore \frac{1}{2.1^3 - 1} &= \frac{1}{7} + \left(-\frac{6}{245}\right) \\
 &= \frac{29}{245}
 \end{aligned}$$

10 (a) $\lim_{x \rightarrow 5} \frac{x - 5}{x^2 - 4x - 5} = \lim_{x \rightarrow 5} \frac{x - 5}{(x - 5)(x + 1)}$

$$\begin{aligned}
 &= \lim_{x \rightarrow 5} \frac{1}{(x + 1)} \\
 &= \frac{1}{6}
 \end{aligned}$$

(b) $\lim_{x \rightarrow \infty} \frac{2 - 5x^4}{3x^2 + 1} = \lim_{x \rightarrow \infty} \frac{\frac{2}{x^2} - \frac{5x^4}{x^2}}{\frac{3x^2}{x^2} + \frac{1}{x^2}}$

$$\begin{aligned}
 &= \lim_{x \rightarrow \infty} \frac{\frac{2}{x^2} - 5x^2}{3 + \frac{1}{x^2}}
 \end{aligned}$$

Apabila $x \rightarrow \infty, \frac{2}{x^2} \rightarrow 0, \frac{1}{x^2} \rightarrow 0$, maka

$$\lim_{x \rightarrow \infty} \frac{\frac{2}{x^2} - 5x^2}{3 + \frac{1}{x^2}} = -\infty$$

Kertas 2

1 (a) $y = -\frac{2}{3 - x} \dots \dots \dots (1)$

$$\begin{aligned}
 y + \delta y &= \frac{2}{3 - (x + \delta x)} \\
 &= -\frac{2}{3 - x - \delta x} \dots \dots \dots (2)
 \end{aligned}$$

(2) - (1):

$$\begin{aligned}
 \delta y &= -\frac{2}{3 - x - \delta x} + \frac{2}{3 - x} \\
 &= \frac{-2(3 - x) + 2(3 - x - \delta x)}{(3 - x)(3 - x - \delta x)} \\
 &= \frac{-6 + 2x + 6 - 2x - 2\delta x}{(3 - x)(3 - x - \delta x)} \\
 \frac{\delta y}{\delta x} &= \frac{-2\delta x}{(3 - x)(3 - x - \delta x)} \div \delta x \\
 \frac{dy}{dx} &= \lim_{\delta x \rightarrow 0} \frac{-2}{(3 - x)(3 - x - \delta x)} \\
 &= -\frac{2}{(3 - x)^2}
 \end{aligned}$$

(b) $y = 2x(x - 3)^2$

(i) $\frac{dy}{dx} = 2(x - 3)^2 + 2x(2)(x - 3)(1)$

$$\begin{aligned}
 &= 2(x - 3)^2 + 4x(x - 3) \\
 &= (x - 3)[2(x - 3) + 4x] \\
 &= (x - 3)(6x - 6) \\
 &= 6(x - 3)(x - 1)
 \end{aligned}$$

(ii) Kecerunan lengkung = -6

$$6(x-3)(x-1) = -6$$

$$(x-3)(x-1) = -1$$

$$x^2 - 4x + 3 + 1 = 0$$

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

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

$$x = 2$$

(c) $y = -6x + 1 \Rightarrow m = -6$

$$y = x^3 + ax^2 - 5x + 1$$

$$\frac{dy}{dx} = 3x^2 + 2ax - 5$$

$$-6 = 3x^2 + 2ax - 5$$

$$x = -1, 3(-1)^2 + 2a(-1) - 5 = -6$$

$$-2a - 2 = -6$$

$$2a = 4$$

$$a = 2$$

$$x = -1, y = (-1)^3 + 2(-1)^2 - 5(-1) + 1 = 7$$

Persamaan tangen: $\frac{y-7}{x+1} = -6$

$$y - 7 = -6x - 6$$

$$y + 6x = 1$$

2 (a) $y = 2x^2 + (x+2)^{-2}$

(i) $\frac{dy}{dx} = 4x + (-2)(x+2)^{-3}$

$$= 4x - \frac{2}{(x+2)^3}$$

$$x = -3, \frac{dy}{dx} = 4(-3) + \frac{2}{(-3+2)^3} = -10$$

(ii) $m_{\text{normal}} = \frac{1}{10}$

$$x = -3, y = 2(-3)^2 + \frac{2}{(-3+2)^3} = 19$$

Persamaan normal: $\frac{y-19}{x+3} = \frac{1}{10}$

$$10y - 190 = x + 3$$

$$10y - x = 193$$

(b) $V = \frac{1}{3}\pi x^2(21-x), \frac{dV}{dt} = 2, x = 2$

$$V = 7\pi x^2 - \frac{1}{3}\pi x^3$$

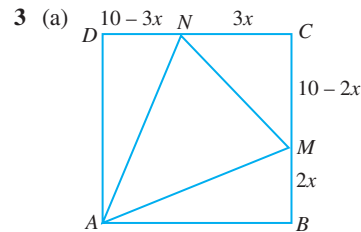
$$\frac{dV}{dx} = 14\pi x - \pi x^2$$

$$x = 2, \frac{dV}{dx} = 14(2)\pi - \pi(2)^2 = 24\pi$$

$$\frac{dx}{dt} = \frac{dx}{dv} \times \frac{dv}{dt}$$

$$= \frac{1}{24\pi} \times 2$$

$$= \frac{1}{12\pi} \text{ cm/s}$$



(i) Luas $\triangle AMN$

$$= 10(10) - \frac{1}{2}(10-3x)(10) - \frac{1}{2}(2x)(10) - \frac{1}{2}(3x)(10-2x)$$

$$= 100 - (50 - 15x) - 10x - 3x(5-x)$$

$$= 100 - 50 + 15x - 10x - 15x + 3x^2$$

$$= (50 - 10x + 3x^2) \text{ cm}^2 \text{ (Tertunjuk)}$$

(ii) Luas adalah minimum, jika $\frac{dA}{dx} = 0$

$$\frac{dA}{dx} = 6x - 10$$

$$6x - 10 = 0$$

$$x = \frac{5}{3}$$

(iii) $\frac{d^2A}{dx^2} = 6 > 0$

$$\therefore A = 50 - 10\left(\frac{5}{3}\right) + 3\left(\frac{5}{3}\right)^2$$

$$= \frac{125}{3} \text{ cm}^2$$

(b) (i) $y = 5 - 3s^2, s = 5x + 1$

$$\frac{dy}{ds} = -6s$$

$$\frac{ds}{dx} = 5$$

$$\frac{dy}{dx} = \frac{dy}{ds} \times \frac{ds}{dx}$$

$$= -30s$$

$$= -30(5x + 1)$$

$$= -150x - 30$$

(ii) $\delta x = 3.98 - 4 = -0.02$

(a) $\frac{ds}{dx} = 5$

$$\delta s \approx \frac{ds}{dx}(\delta x)$$

$$= 5(-0.02)$$

$$= -0.1$$

(b) $\delta y \approx \frac{dy}{dx}(\delta x)$

$$= [-150(4) - 30](-0.02)$$

$$= (-630)(-0.02)$$

$$= 12.6$$