

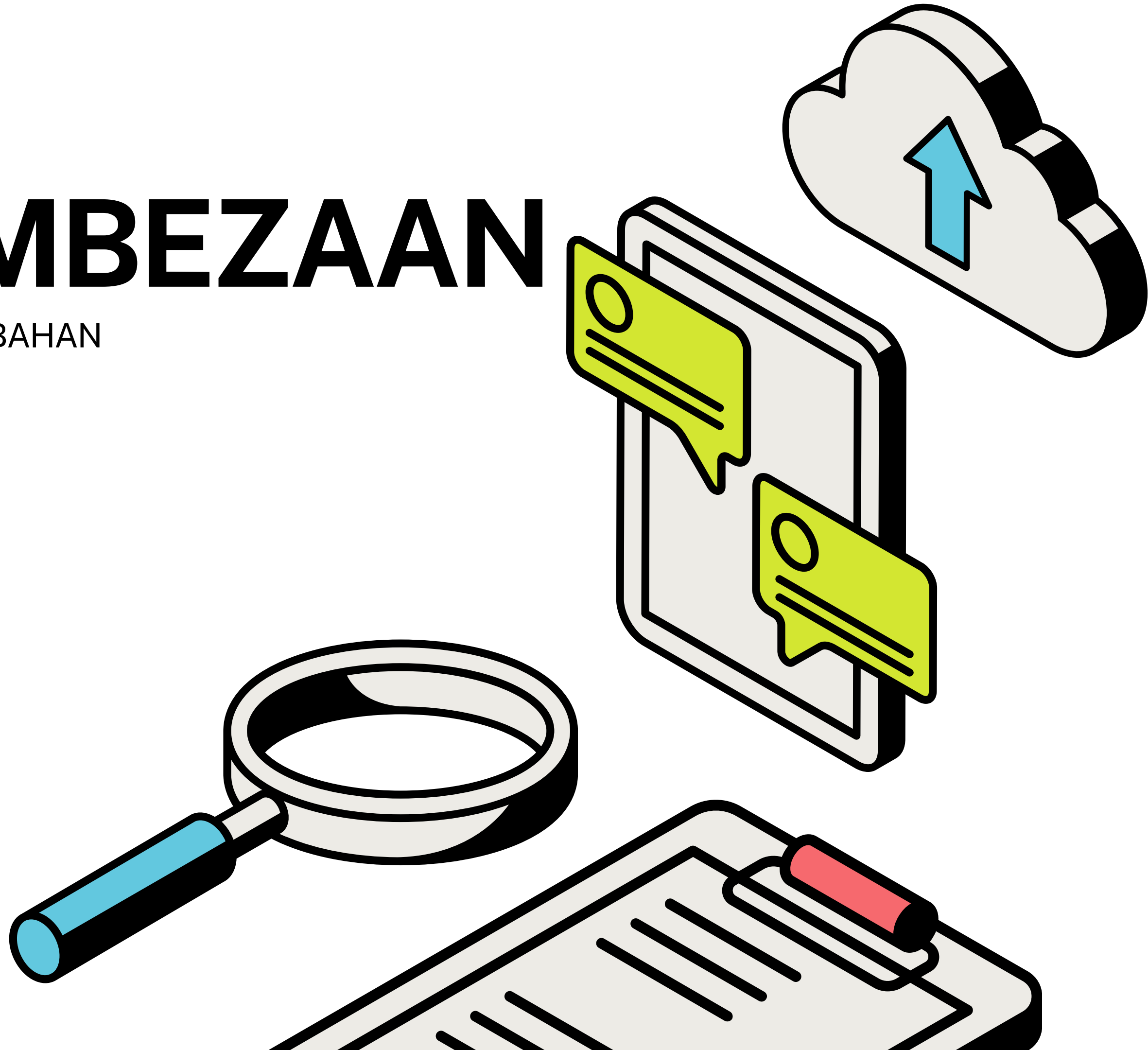
TINGKATAN 5

# BAB 2: PEMBEZAAN

KOMPILASI SOALAN MATEMATIK TAMBAHAN  
PERCUBAAN SPM 2023

**SKEMA PEMARKAHAN**

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**KELANTAN (K1)****PEMBEZAAN**

11. (a) Diberi dua fungsi,  $y = f(u)$  dan  $u = g(x)$ . Menggunakan idea had, buktikan,  
 Given two functions,  $y = f(u)$  and  $u = g(x)$ . Using the idea of limits, prove that,

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

[3 markah]

[3 marks]

- (b) Diberi  $y = 5t^2 + 2t$  dan  $x = 1 - 2t$ . Cari  $\frac{dy}{dx}$  dalam sebutan  $x$ .

[3 markah]

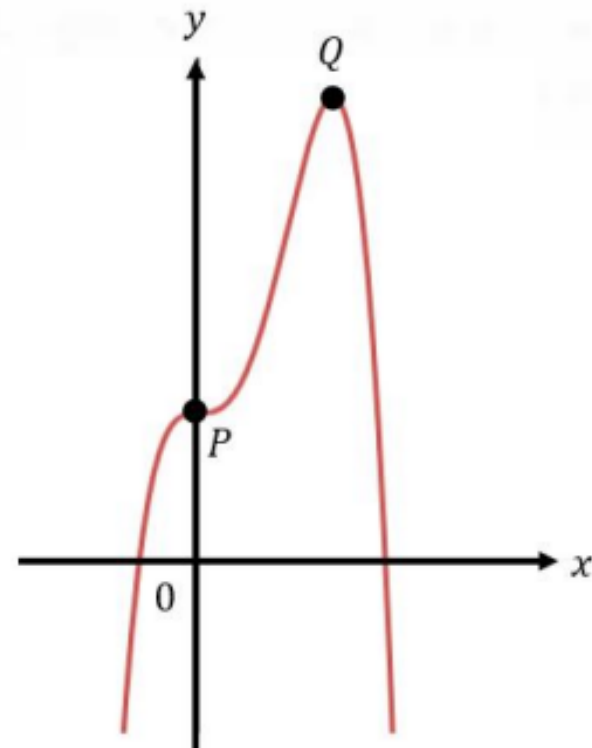
Given  $y = 5t^2 + 2t$  and  $x = 1 - 2t$ . Find  $\frac{dy}{dx}$  in terms of  $x$ .

[3 marks]

11	(a) $\frac{\delta y}{\delta x} = \frac{\delta y}{\delta u} \times \frac{\delta u}{\delta x}$	K1
	$\text{had}_{\delta x \rightarrow 0} \frac{\delta y}{\delta x} = \text{had}_{\delta u \rightarrow 0} \frac{\delta y}{\delta u} \times \text{had}_{\delta x \rightarrow 0} \frac{\delta u}{\delta x}$	K1
	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$	N1
11	(b) $\frac{dy}{dx} = 10t + 2$ or $\frac{dx}{dt} = -2$	K1
	$\frac{dy}{dx} = (10t + 2) \times \frac{1}{-2}$	K1
	$\frac{dy}{dx} = \frac{5x - 7}{2}$	N1

**MELAKA (K1)****PEMBEZAAN**

6. (a) Rajah 5 menunjukkan sebahagian daripada lengkung  $y = -x^3(x - 3) + 4$ .  
Diagram 5 shows a part of the curve  $y = -x^3(x - 3) + 4$ .



Rajah 5  
Diagram 5

- (a) Cari koordinat titik bagi dua titik pegun  $P$  dan  $Q$ .  
Find the coordinates of the two stationary points,  $P$  and  $Q$

[2 markah]  
[2 marks]

- (b) Seterusnya, tentukan sifat bagi titik pegun  $P$  menggunakan kaedah lakaran tangen.  
Hence, determine the nature of stationary point  $P$  by using the tangent sketching method.

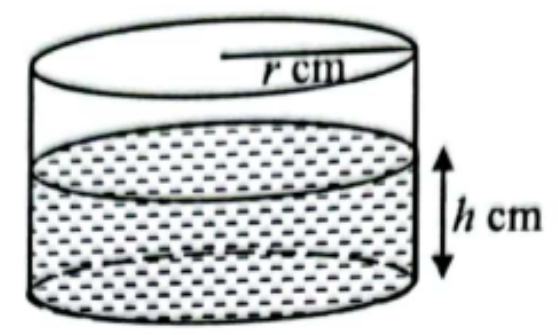
[2 markah]  
[2 marks]

6. (a)	$\frac{dy}{dx} = -4x^3 + 9x^2$ dan $x^2(-4x + 9) = 0$			1																
	$P(0, 4)$ dan $Q\left(\frac{9}{4}, 12.54\right)$ or $Q\left(\frac{9}{4}, 12\frac{139}{256}\right)$			1																
(b)	<table border="1"> <tbody> <tr> <td><math>x</math></td> <td>-1</td> <td>0</td> <td>1</td> </tr> <tr> <td><math>\frac{dy}{dx}</math></td> <td><math>-4(-1)^3 + 9(-1)^2 = 13</math></td> <td>0</td> <td><math>-4(1)^3 + 9(1)^2 = 5</math></td> </tr> <tr> <td>Tanda bagi <math>\frac{dy}{dx}</math></td> <td>+</td> <td>0</td> <td>+</td> </tr> <tr> <td>Lakaran Tangen</td> <td>/</td> <td>-</td> <td>/</td> </tr> </tbody> </table>			$x$	-1	0	1	$\frac{dy}{dx}$	$-4(-1)^3 + 9(-1)^2 = 13$	0	$-4(1)^3 + 9(1)^2 = 5$	Tanda bagi $\frac{dy}{dx}$	+	0	+	Lakaran Tangen	/	-	/	1
$x$	-1	0	1																	
$\frac{dy}{dx}$	$-4(-1)^3 + 9(-1)^2 = 13$	0	$-4(1)^3 + 9(1)^2 = 5$																	
Tanda bagi $\frac{dy}{dx}$	+	0	+																	
Lakaran Tangen	/	-	/																	
	<table border="1"> <tbody> <tr> <td>Lakaran Graf</td> <td colspan="3"> </td> </tr> </tbody> </table>			Lakaran Graf				1												
Lakaran Graf																				
	$P(0, 4)$ ialah titik lengkok balas.			1																

# PEMBEZAAN

**N9 (K1)**

7 Rajah 5 menunjukkan sebuah bekas besi yang berbentuk silinder tertutup. Diberi jejari bekas,  $r$  cm, dan tinggi air dalam bekas,  $h$  cm.  
 Diagram 5 shows an iron container with a close top is cylindrical in shape. Given the radius of the container,  $r$  cm, and the height of water in the container,  $h$  cm.



Rajah 5  
Diagram 5

Diberi bahawa isi padu air dalam bekas ialah  $175\pi$  cm<sup>3</sup> dan  $h = 7$  cm. Apabila bekas tersebut direndam dalam air sejuk, tinggi air mengalami peningkatan kecil sebanyak  $p$  cm.

[Isi padu silinder,  $V = \pi r^2 h$ ]

Given that the volume of the water in the container is  $175\pi$  cm<sup>3</sup> and  $h = 7$  cm. When the container is soaked in cool water, the height of the water shows a small increase in  $p$  cm.

[Volume of cylinder,  $V = \pi r^2 h$ ]

Cari

Find

(a) perubahan kecil bagi jejari, dalam cm, dalam sebutan  $p$ , [4 markah]  
 small change in the radius, in cm, in terms of  $p$ , [4 marks]

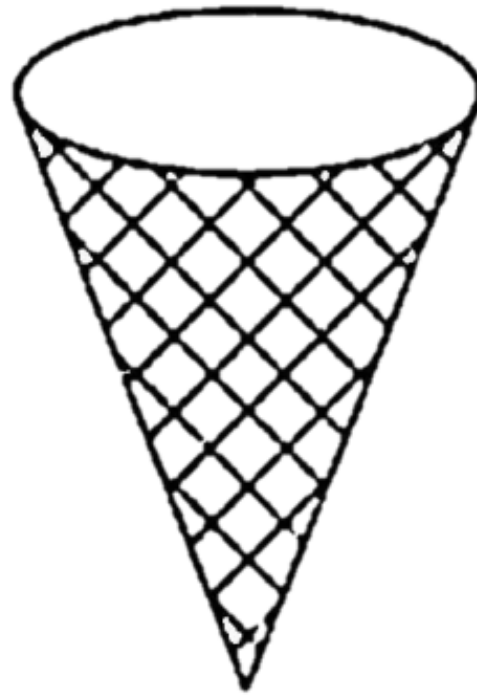
(b) peratus perubahan kecil bagi jejari, seterusnya perihalkan peratusan tersebut. [2 markah]  
 the percentage of the small change in the radius, hence describe the percentage. [2 marks]

7	(a)	$r = 5$ atau $h = \frac{V}{\pi r^2}$ atau $h = \frac{175\pi}{\pi r^2}$	P1
		$\frac{dh}{dr} = -2(175) r^{-3}$	K1
		$p = \frac{-2(175)}{5^3} \times \delta r$	K1
		$\delta r = -\frac{5p}{14}$ // $\delta r = -0.3571p$	N1
	(b)	$\left(\frac{-5p}{14}\right) \times 100$	K1
		Jejari berkurang $\frac{50}{7} p\%$ // $7.143 p\%$	N1



## PAHANG (K1)

10



Rajah 7  
Diagram 7

Rajah 7 menunjukkan sebuah ais krim kon. Isipadu,  $V \text{ cm}^3$  bagi ais krim kon tersebut menyusut daripada  $93.6 \text{ cm}^3$  kepada  $93 \text{ cm}^3$ . Jika tinggi ais krim kon sentiasa tiga kali jejari ais krim kon itu, cari perubahan hampir bagi jejari apabila jejari ais krim kon ialah  $3.1 \text{ cm}$ .

*Diagram 7 shows an ice cream cone. The volume,  $V \text{ cm}^3$  of the ice cream cone decreases from  $93.6 \text{ cm}^3$  to  $93 \text{ cm}^3$ . If the height of the ice cream cone is always three times the radius of the ice cream cone, find the approximate change in radius when the radius of the ice cream cone is  $3.1 \text{ cm}$ .*

[5 markah]

## PEMBEZAAN

10

$$V = \pi j^3$$

1

$$\partial V = -0.6 \text{ cm}^3$$

1

$$\frac{dV}{dj} = 3\pi j^2$$

1

Guna rumus  $\partial V = \frac{dV}{dj} \times \partial j$  dan gantikan nilai

1

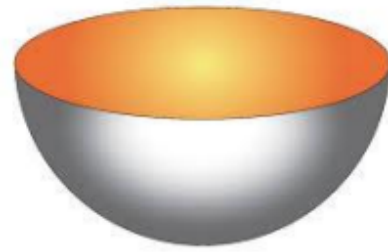
$$-0.6 = 3\pi(3.1)^2 \times \partial j$$

$$\partial j = -0.006624 // -0.006625 // -\frac{20}{961\pi}$$

1

**PERLIS (K1)****PEMBEZAAN**

- 3 Rajah 3 menunjukkan sebuah bekas berbentuk hemisfera.  
Diagram 3 shows a hemispherical shaped container.



Rajah 3 / Diagram 3

- a) Cari perubahan hampir dalam isipadu bagi sebuah hemisfera apabila jejari berubah daripada 15 cm kepada 15.02 cm.  
*Find the approximate change in the volume of the hemisphere when its radius changes from 15 cm to 15.02 cm.*
- [ 3 markah / marks ]
- b) Isipadu sebuah hemisfera menyusut pada kadar  $5.4\pi \text{ cm}^3\text{s}^{-1}$ . Cari kadar perubahan jejari hemisfera itu apabila jejari ialah 15 cm.  
*The volume of a hemisphere decreases at a rate of  $5.4\pi \text{ cm}^3\text{s}^{-1}$ . Find the rate of change in the radius of the hemisphere when the radius is 15 cm.*
- [ 3 markah / marks ]

3

(a)

$$\begin{aligned}\frac{dv}{dr} &= 2\pi r^2 \\ &= 2\pi (15)^2\end{aligned}$$

K1

$$\begin{aligned}\delta V &= 2\pi (15)^2 \times 0.02 \\ &= 9\pi\end{aligned}$$

K1

N1

3

(b)

$$\frac{dv}{dt} = -5.4\pi$$

K1

$$\frac{dr}{dt} = \frac{1}{450\pi} \times (-5.4\pi)$$

K1

$$-0.012$$

N1

3

**PERLIS (K1)**

**PEMBEZAAN**

14 (a) Diberi persamaan lengkung  $y = 5 + 6x^2 - x^3$  melalui titik  $P (1, 10)$ . Cari persamaan tangen kepada lengkung itu pada titik  $P$ .  
*Given the equation of the curve  $y = 5 + 6x^2 - x^3$  passes through point  $P (1,10)$ . Find the equation of tangent to the curve at point  $P$ .*  
 [ 4 markah / marks ]

(b) Cari koordinat titik pusingan bagi lengkung  $y = 5 + 6x^2 - x^3$ .  
*Find the coordinate of turning points of the curve  $y = 5 + 6x^2 - x^3$ .*  
 [ 4 markah / marks ]

14

(a)

$$\frac{dy}{dx} = 12(1) - 3(1)^2 \quad \text{(K1)}$$

$$= 9 \quad \text{(N1)}$$

$$y - 10 = 9(x - 1) \text{ atau } 10 = 9(1) + c \quad \text{(K1)}$$

$$y = 9x + 1 \quad \text{(N1)}$$

4

(b)

$$\frac{dy}{dx} = 12x - 3x^2 = 0$$

$$3x(4 - x) = 0 \quad \text{(K1)}$$

$$x = 0, \quad x = 4 \quad \text{(N1)}$$

$$(0, 5) \quad (4, 37) \quad \text{(N1)} \quad \text{(N1)}$$

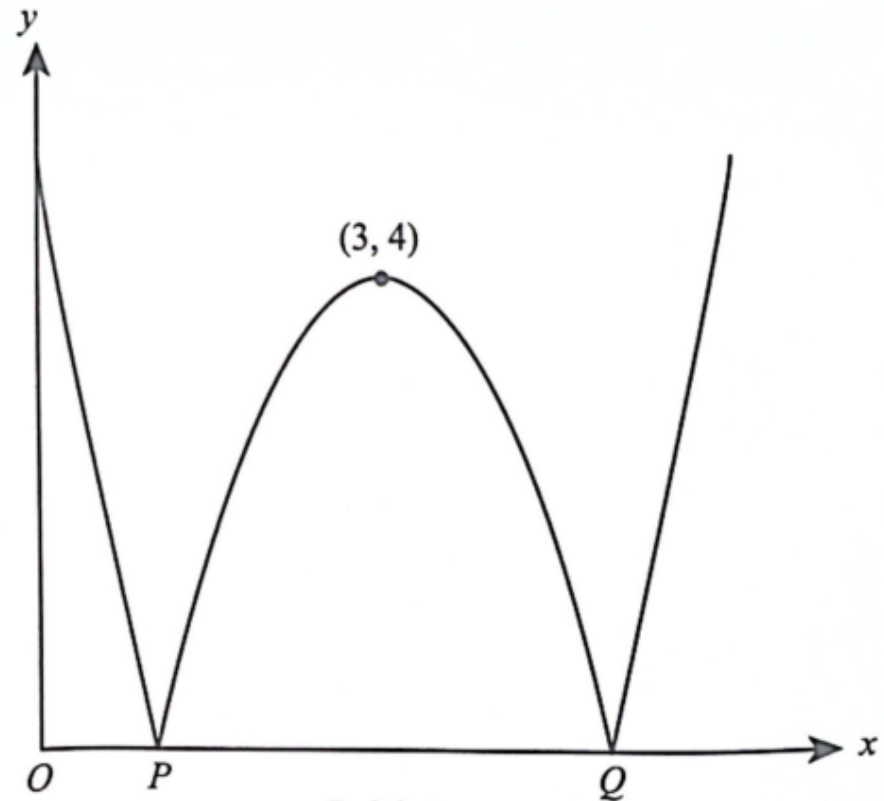
4

8

**SELANGOR SET 1 (K1)****PEMBEZAAN**

- 5 Rajah 5 menunjukkan graf lengkung  $y = |(x - m)^2 + 1 - n|$  dengan titik pusingan  $(3, 4)$ . Titik-titik  $P$  dan  $Q$  terletak pada paksi- $x$ .

Diagram 5 shows the graph of the curve  $y = |(x - m)^2 + 1 - n|$  with the turning point  $(3, 4)$ . Points  $P$  and  $Q$  are on the  $x$ -axis.



Rajah 5  
Diagram 5

Nyatakan

State

- (a) titik pusingan bagi graf lengkung  $y = (x - m)^2 + 1 - n$ ,  
the turning point for the graph of the curve  $y = (x - m)^2 + 1 - n$ ,

- (b) persamaan paksi simetri bagi lengkung itu jika graf bergerak 2 unit ke kanan,  
the equation of the axis of symmetry for the curve if the graph moves 2 units to the right,
- (c) nilai  $m$  dan nilai  $n$ .  
the value of  $m$  and of  $n$ .

[5 markah]

[5 marks]

5	(a)	$(3, -4)$	N1
	(b)	$x = 5$	N1
	(c)	$m = 3$ $1 - n = 4$ $n = -3$	N1 K1 N1



## SELANGOR SET 1 (K1)

## PEMBEZAAN

9 (a) Diberi bahawa  $\frac{d}{dx} \left( \frac{3x+2}{4x-1} \right) = \frac{p}{(4x-1)^2}$ , cari nilai bagi  $p$ .

It is given that  $\frac{d}{dx} \left( \frac{3x+2}{4x-1} \right) = \frac{p}{(4x-1)^2}$ , find the value of  $p$ .

[2 markah]

[2 marks]

13 Diberi bahawa  $L = 4t - t^2$  dan  $x = 3 + 6t$ .

It is given that  $L = 4t - t^2$  and  $x = 3 + 6t$ .

(a) (i) Ungkapkan  $\frac{dL}{dx}$  dalam sebutan  $t$ .

Express  $\frac{dL}{dx}$  in terms of  $t$ .

[3 markah]

[3 marks]

(ii) Cari nilai  $\frac{dL}{dx}$  apabila  $t = 4$ .

Find value of  $\frac{dL}{dx}$  when  $t = 4$ .

[1 markah]

[1 mark]

(b) Hitungkan peratusan kadar perubahan dalam  $L$  yang sepadan apabila  $x = 9$ , jika perubahan kecil dalam  $x$  ialah 10%.

Calculate the corresponding percentage rate of change of  $L$  when  $x = 9$ , if the small change in  $x$  is 10%.

[4 markah]

[4 marks]

9	(a)	Bezakan menggunakan petua hasil bahagi $\frac{dy}{dx} = \frac{3(4x-1)-4(3x+2)}{(4x-1)^2}$ atau $p = 3(4x-1) - 4(3x+2)$ -11	K1  N1
---	-----	--	--------------

13	(a)	(i)	Guna petua rantai $\frac{dL}{dt} = 4 - 2t, \frac{dx}{dt} = 6$ $\frac{dL}{dx} = (4 - 2t) \left( \frac{1}{6} \right)$ $\frac{2-t}{3}$	K1 K1  N1
		(ii)	$-\frac{2}{3}$	N1
	(b)		$\frac{\delta L}{L} \times 100\%, \delta x = 0.1$ Apabila $x = 9, 9 = 3 + 6t$ $t = 1, L = 3$ Gunakan $\frac{dL}{dx} \approx \frac{\delta L}{\delta x}$ $\delta L = \frac{1}{3}$ $\frac{1/3}{3} \times 100\%$ 11.11%	P1  K1 K1 N1

**SELANGOR SET 2 (K1)****PEMBEZAAN**

- 9 Diberi bahawa fungsi  $f(x) = (x - 3)(x^2 - 9)$ .  
It is given that function  $f(x) = (x - 3)(x^2 - 9)$ .

Cari

Find

- (a) fungsi kecerunan  $f(x)$ ,  
the gradient function of  $f(x)$ ,

[2 markah]  
[2 marks]

- (b) titik-titik pegun bagi  $f(x)$  dan tentukan sifat bagi setiap titik pegun,  
the stationary points for  $f(x)$  and determine the nature of each stationary point,

[3 markah]  
[3 marks]

- (c) nilai  $f(1.001)$  dengan menggunakan konsep kalkulus.  
the value of  $f(1.001)$  by using the concept of calculus.

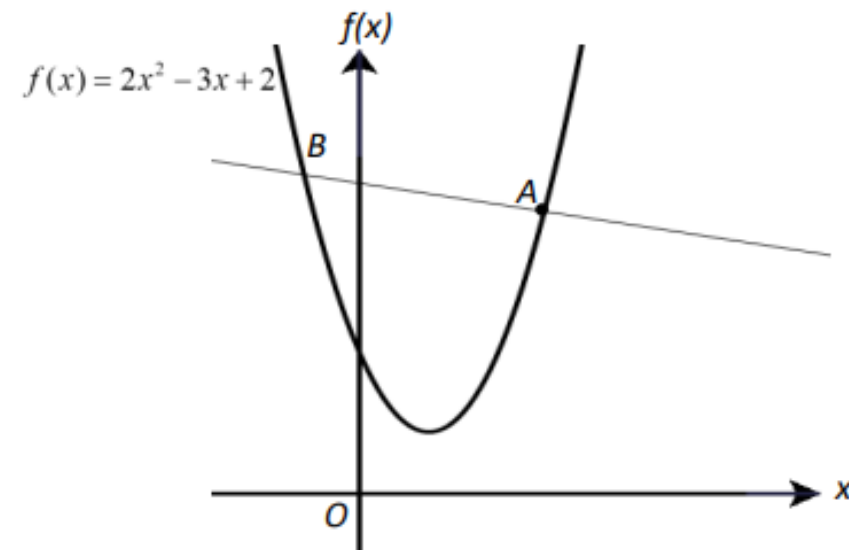
[3 markah]  
[3 marks]

9	(a)	$f'(x) = (1)(x^2 - 9) + 2x(x - 3)$ @ kembang $= 3x^2 - 6x - 9$	K1 N1
	(b)	$0 = 3(x - 3)(x + 1)$ $x = 3, x = -1$ $y = 0, y = 32$ $f''(x) = 6x - 6$ $f''(3) = 6(3) - 6$ atau $f''(-1) = 6(-1) - 6$ $= 12 > 0$ $= -12 < 0$ (3, 0) ialah titik minimum dan (-1, 32) ialah titik maksimum. (3, 0) is a minimum point and (-1, 32) is a maximum point.	K1  K1 N1
	(c)	$f(1) = 16, \delta x = 0.001$ $f'(1) = 3(1 - 3)(1 + 1)$ $= -12$ $\frac{\delta f(x)}{0.001} \approx -12$ $f(1.001) = 16 + (-0.012)$ $= 15.988$	K1  K1 N1

**KELANTAN (K2)****PEMBEZAAN**

(b) Rajah 8 menunjukkan satu lengkung  $f(x) = 2x^2 - 3x + 2$  dan garis lurus  $AB$  adalah normal kepada lengkung itu pada titik  $A$ .

Diagram 8 shows a curve  $f(x) = 2x^2 - 3x + 2$  and straight lines  $AB$  which is normal to the curve at point  $A$ .



Rajah 8  
Diagram 8

Garis lurus  $AB$  adalah selari dengan garis lurus  $5y = 10 - x$ . Cari persamaan tangen kepada lengkung itu pada titik  $A$ . [4 markah]

The straight lines  $AB$  is parallel to the straight line  $5y = 10 - x$ . Find the equation of the tangent to the curve at point  $A$ . [4 marks]

11(b)

$$-\frac{1}{5} \times m_T = -1 \text{ dan } m_T = 5$$

$$\frac{dy}{dx} = 4x - 3 = 5$$

$$y = 2(2)^2 - 3(2) + 2 \text{ atau } A(2, 4)$$

$$y = 5x - 6$$

K1

K1

K1

N1

**MELAKA (K2)****PEMBEZAAN**

- 4 (a) Diberi,  $y = 2\sqrt{x}$   
 Given  $y = 2\sqrt{x}$
- (i) cari  $\frac{dy}{dx}$  dengan menggunakan prinsip pertama.  
*find  $\frac{dy}{dx}$  by using the first principle.*  
 [3 markah / marks]
- (ii) seterusnya, hitung perubahan kecil bagi  $y$  apabila  $x$  berubah dari 25 ke 25.04.  
*hence, find the small changes in  $y$  when  $x$  increases from 25 to 25.04*  
 [2 markah / marks]
- (b) Isipadu sebuah hemisfera mengurang dengan kadar tetap  $1.02\pi \text{ cm}^3 \text{ s}^{-1}$ . Cari jejari hemisfera itu pada ketika jejari berkurang dengan kadar  $0.1 \text{ cm s}^{-1}$ .  
*The volume of a hemisphere is decreasing at a constant rate of  $1.02\pi \text{ cm}^3 \text{ s}^{-1}$ . Find the radius of the hemisphere at the instant when the radius is decreasing at a rate of  $0.1 \text{ cms}^{-1}$ .*  
 [3 markah / marks]

<b>4 (a) (i)</b>	$y + \partial y = 2\sqrt{x + \partial x}$ $\partial y = 2\sqrt{x + \partial x} - 2\sqrt{x}$ $\partial y = (2\sqrt{x + \partial x} - 2\sqrt{x}) \times \frac{(2\sqrt{x + \partial x} + 2\sqrt{x})}{(2\sqrt{x + \partial x} + 2\sqrt{x})}$ $= \frac{4\partial x}{(2\sqrt{x + \partial x} + 2\sqrt{x})}$ $\text{had}_{\partial x \rightarrow 0} \frac{\partial y}{\partial x} = \frac{4}{(2\sqrt{x + \partial x} + 2\sqrt{x})}$ $\frac{dy}{dx} = \frac{1}{\sqrt{x}}$	1 1 1
<b>(a) ii</b>	$\partial y = \frac{1}{\sqrt{25}} \times (0.04)$ $\partial y = 0.008$	1 1
<b>(b)</b>	$\frac{\partial V}{\partial j} = 2\pi j^2$ $-1.02\pi = 2\pi j^2 \times (-0.1)$ $j = 2.258 \text{ cm}$	1 1 1



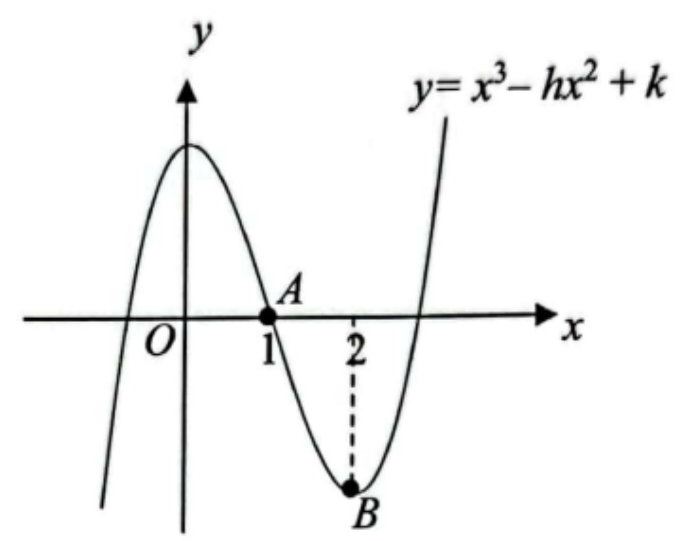
# PEMBEZAAN

**N9 (K2)**

4 (a) Diberi  $\lim_{\delta x \rightarrow 0} \frac{\delta y}{\delta x} = 10x$ . Dengan menggunakan prinsip pertama, tunjukkan nilai  $a$  dalam fungsi  $y = ax^2$  ialah 5. [4 markah]

Given  $\lim_{\delta x \rightarrow 0} \frac{\delta y}{\delta x} = 10x$ . By using first principles, prove that the value of  $a$  in function  $y = ax^2$  is 5. [4 marks]

(b) Rajah 1 menunjukkan graf  $y = x^3 - hx^2 + k$ . Titik A ialah pintasan-x dan titik B ialah titik pusingan bagi graf tersebut. Diagram 1 shows a graph of  $y = x^3 - hx^2 + k$ . Point A is the x-intercept and point B is a turning point of the graph.



Rajah 1 / Diagram 1

Cari nilai  $h$  dan  $k$ .  
Find the value of  $h$  and of  $k$ .

[5 markah]  
[5 marks]

4(a)	$y + \delta y = a(x + \delta x)^2$ atau $\frac{a(x + \delta x)^2 - ax^2}{\delta x}$	K1
	$\frac{\delta y}{\delta x} = 2ax + a\delta x$ atau $\lim_{\delta x \rightarrow 0} 2ax + a\delta x$	K1
	$2ax + a(0) = 10x$	K1
	$a = 5$ (tertunjuk)	N1
(b)	$\frac{dy}{dx} = 3x^2 - 2hx$	K1
	$3(2)^2 - 2h(2) = 0$	K1
	$h = 3$	N1
	$0 = 1^3 - 3(1)^2 + k$	K1
	$k = 2$	N1

**PAHANG (K2)****PEMBEZAAN**

- 7 Lengkung  $y = x^3 - 6x^2 + 9x + 4$  melalui titik  $M(2,6)$  dan mempunyai dua titik pusingan,  $K(1,8)$  dan  $L$ .

*The curve  $y = x^3 - 6x^2 + 9x + 4$  passes through the point  $M(2,6)$  and has two turning points  $K(1,8)$  and  $L$ .*

- (a) Cari nilai kecerunan lengkung dan persamaan normal kepada lengkung itu pada titik  $M$ .

*Find the value of the gradient of the curve and the normal equation to the curve at point  $M$ .*

[4 markah]

[4 marks]

- (b) Tentukan sama ada  $L$  adalah titik maksimum atau minimum.

*Determine whether  $L$  is a maximum or a minimum point.*

[4 markah]

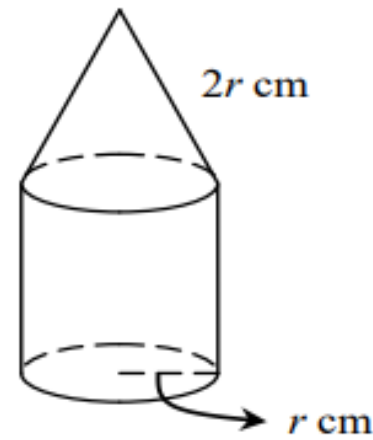
[4 marks]

7	(a)	$\frac{dy}{dx} = 3x^2 - 12x + 9$	1
		Ganti $x = 2$ dan guna $m_1 \times m_2 = -1$	1
		$y - 6 = \frac{1}{3}(x - 2)$	1
		$y = \frac{1}{3}x + \frac{16}{3}$	1
7	(b)	Guna $\frac{dy}{dx} = 0$ dan selesaikan $(x - 1)(x - 3) = 0$	1
		$L(3,4)$	1
		Bezakan kali ke-2 dan gantikan nilai $x = 3$ ke dalamnya. $\frac{d^2y}{dx^2} = 6x - 12$ $= 6(3) - 12$	1
		$6 > 0, \therefore$ minimum	1

**SABAH (K2)****PEMBEZAAN**

7. Rajah 7 menunjukkan sebuah bongkah pepejal yang terdiri daripada sebuah kon tegak terletak di atas sebuah silinder berjari  $r$  cm. Panjang sendeng kon itu ialah  $2r$  cm dan isi padu silinder itu ialah  $81\pi \text{ cm}^3$ .

Diagram 7 shows a solid block consisting of a right cone which is located above a cylinder of radius  $r$  cm. The length of slant of the cone is  $2r$  cm and the volume of the cylinder is  $81\pi \text{ cm}^3$ .



Rajah 7/Diagram 7

- a) Tunjukkan bahawa luas permukaan bongkah itu,  $L \text{ cm}^2$  diberi oleh  $L = 3\pi \left( r^2 + \frac{54}{r} \right)$ .

Show that the surface area of the block,  $L \text{ cm}^2$  is given by  $L = 3\pi \left( r^2 + \frac{54}{r} \right)$ .

[3 markah/marks]

- b) Hitung nilai minimum bagi luas permukaan bongkah itu, dalam sebutan  $\pi$ .

Calculate the minimum value for the surface area of the block, in terms of  $\pi$ .

[3 markah/marks]

- c) Diberi bahawa  $L$  bertambah dengan kadar  $63\pi \text{ cm}^2\text{s}^{-1}$ , cari kadar pertambahan jejari ketika jejaringnya ialah 6 cm.

It is given that  $L$  is increasing at a rate of  $63\pi \text{ cm}^2\text{s}^{-1}$ , find the increasing rate of radius when the radius is 6 cm.

[2 markah/marks]

- d) Cari perubahan kecil  $L$  apabila  $r$  menokok daripada 6 cm kepada 6.002 cm.

Find the small change in  $L$  when  $r$  increases from 6 cm to 6.002 cm.

[2 markah/marks]

7	a) $\pi r^2 h = 81\pi$ $L = \pi r(2r) + 2\pi r \left( \frac{81}{r^2} \right) + \pi r^2$ $L = 3\pi \left( r^2 + \frac{54}{r} \right)$	K1 K1 N1
	b) Bezakan $L$ terhadap $r$ <hr/> $\frac{dL}{dr} = 3\pi \left( 2r - \frac{54}{r^2} \right)$  Samakan $\frac{dL}{dr}$ dengan 0 & Selesaikan untuk $r$ <hr/> $3\pi \left( 2r - \frac{54}{r^2} \right) = 0$  $81\pi$	K1   K1   N1
	c) $\frac{dr}{dt} = \frac{1}{3\pi \left( 2(6) - \frac{54}{(6)^2} \right)} \times 63\pi$  2	K1  N1
	d) $\frac{dL}{dr} = (6.002 - 6) \times \frac{63}{2} \pi$  0.063 $\pi$	K1  N1



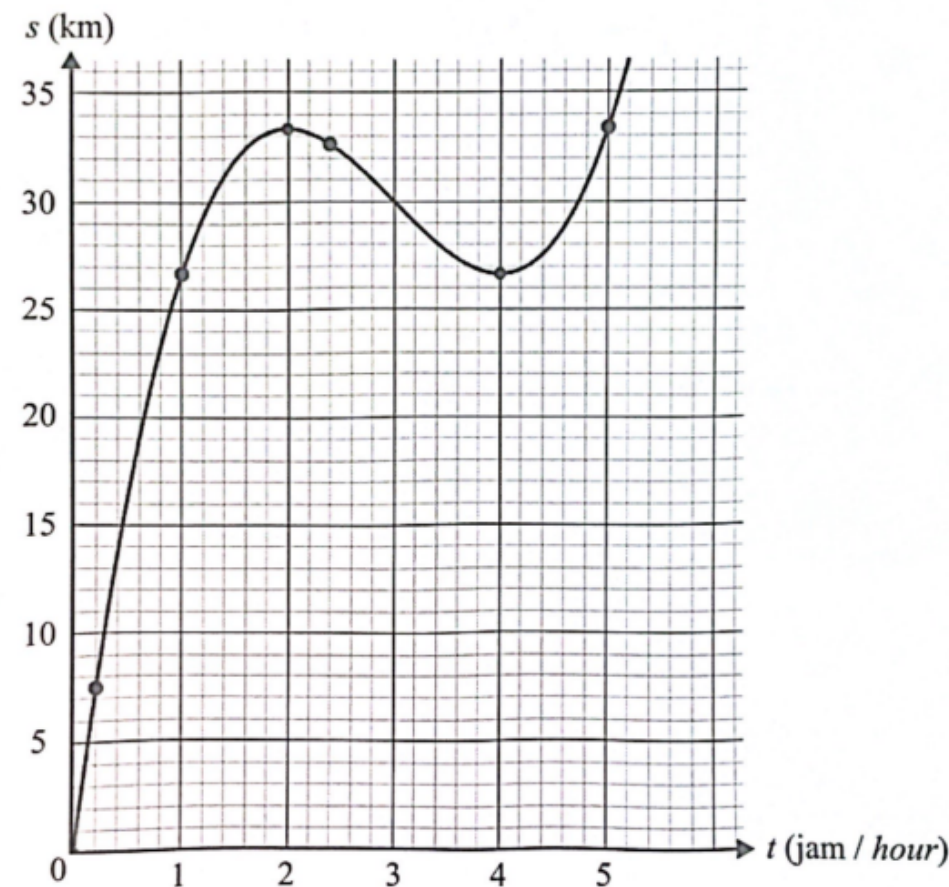
**SELANGOR SET 1 (K2)**

**PEMBEZAAN**

5 Penyelesaian secara lukisan berskala tidak diterima.  
Solutions by scale drawing is not accepted.

Rajah 5 menunjukkan kedudukan Michelle sewaktu berlari dalam tempoh masa 5 jam diberikan oleh persamaan lengkung  $s = \frac{t}{3}(t^2 - 9t + 24)$  km dengan keadaan  $t$  ialah masa, dalam jam.

Diagram 5 shows the position of Michelle when running in the period of 5 hours is given by the equation of a curve  $s = \frac{t}{3}(t^2 - 9t + 24)$  km where  $t$  is the time, in hour.



Rajah 5  
Diagram 5

(a) Cari cerun bagi lengkung itu pada  $t = 2.4$ .  
Find the slope of the curve at  $t = 2.4$ .

[2 markah]  
[2 marks]

(b) Cari kedudukan tepat Michelle pada titik pusingan.  
Find the exact position of Michelle at the turning points.

[3 markah]  
[3 marks]

(c) Seterusnya, menggunakan kalkulus, tunjukkan setiap kedudukan di 5(b) adalah maksimum atau minimum.

Hence, by using calculus, show that each of the positions in 5(b) is a maximum or a minimum.

[4 markah]  
[4 marks]

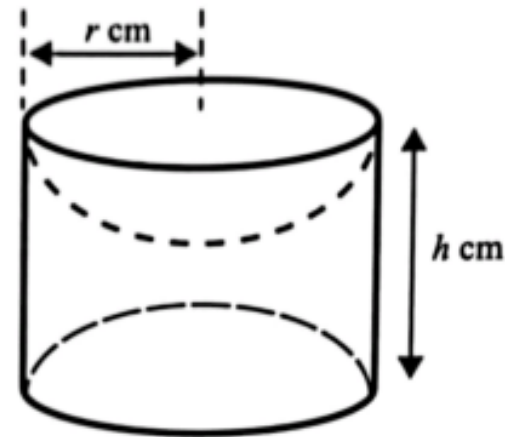
5	(a)	<p>Bezakan <math>s</math> terhadap <math>t</math></p> $\frac{ds}{dt} = t^2 - 6t + 8$ <p>Ganti <math>t = 2.4</math> ke dalam pembezaan</p> $(2.4)^2 - 6(2.4) + 8$ $-0.64 // -\frac{16}{25}$	K1    N1
	(b)	<p><math>\frac{ds}{dt} = 0</math></p> <p>Selesaikan persamaan kuadratik secara pemfaktoran atau formula</p> $t^2 - 6t + 8 = 0$ $t = 2, 4$ <p>Gantikan <math>t = 2, 4</math> ke dalam <math>s</math></p> $s = \frac{38}{3} @ \frac{124}{3}$ <p>Kedudukan paling rendah <math>\frac{38}{3}</math> &amp; Puncak bukit <math>\frac{124}{3}</math></p>	K1  K1  N1
	(c)	<p>Bezakan <math>\frac{ds}{dt}</math> terhadap <math>t</math></p> $\frac{d^2s}{dt^2} = 2t - 6$ <p>Apabila <math>t = 2, \frac{d^2s}{dt^2} = -2 &lt; 0</math> &amp;</p> <p>Apabila <math>t = 4, \frac{d^2s}{dt^2} = 2 &gt; 0</math></p>	K1  K1
		$\frac{38}{3}$ kedudukan maksimum	N1
		$\frac{124}{3}$ kedudukan minimum	N1



## SELANGOR SET 2 (K2)

## PEMBEZAAN

- 8 Rajah 8 menunjukkan satu bongkah silinder dengan isi padu  $256\pi \text{ cm}^3$ . Dua hemisfera yang sama dengan jejari  $r \text{ cm}$  dikeluarkan dari setiap hujungnya.  
 Diagram 8 shows a solid cylinder with volume  $256\pi \text{ cm}^3$ . Two identical hemispheres with radius  $r \text{ cm}$  are removed from each end.



Rajah 8  
Diagram 8

- (a) Tunjukkan bahawa jumlah luas permukaan,  $A \text{ cm}^2$ , bagi baki bongkah yang tertinggal itu diberi oleh  $A = 4\pi r^2 + \frac{512\pi}{r}$ .  
 [Luas permukaan sfera =  $4\pi r^2$ ]  
 Show that the total surface area,  $A \text{ cm}^2$ , of the remaining solid is given by  $A = 4\pi r^2 + \frac{512\pi}{r}$ .  
 [Surface area of sphere =  $4\pi r^2$ ]  
 [3 markah]  
 [3 marks]
- (b) Hitung jumlah luas permukaan minimum, dalam sebutan  $\pi$ , bagi baki bongkah yang tertinggal itu.  
 Calculate the minimum total surface area, in term of  $\pi$ , of the remaining solid.  
 [4 markah]  
 [4 marks]
- (c) Baki bongkah yang tertinggal itu dipanaskan dan kadar perubahan jumlah luas permukaan bagi bongkah tersebut ialah  $84\pi \text{ cm}^2 \text{ s}^{-1}$ . Hitung kadar perubahan jejari bongkah tersebut apabila jejarinya ialah  $8 \text{ cm}$ .  
 The remaining solid is heated and the rate of change of its total surface area of the solid is  $84\pi \text{ cm}^2 \text{ s}^{-1}$ . Calculate the rate of change of the radius of the solid when its radius is  $8 \text{ cm}$ .  
 [3 markah]  
 [3 marks]

8	(a)	$h = \frac{256}{r^2}$ Ganti * $h$ ke dalam $A = 2\pi r h + 4\pi r^2$  $A = 4\pi r^2 + \frac{512\pi}{r}$	P1 K1 N1
	(b)	Guna $\frac{dA}{dr} = 0$ & selesaikan *persamaan kubik. <hr/> $8\pi r - \frac{512\pi}{r^2} = 0$ $r = 4$ $A = 4\pi(*4)^2 + \frac{512\pi}{*4}$ $= 192\pi$	K1 N1 K1 N1
	(c)	$\frac{dA}{dt} = 84\pi$ Guna $\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dt}$ <hr/> $84\pi = 8\pi(8) - \frac{512\pi}{8^2} \times \frac{dr}{dt}$	P1 K1 N1
		1.5	

**TERENGGANU (K2)****PEMBEZAAN**

11 Diberi bahawa persamaan suatu lengkung ialah  $y = x^2(x - 2)$ .

*It is given that the equation of a curve is  $y = x^2(x - 2)$ .*

(a) Cari

*Find*

- (i) fungsi kecerunan bagi lengkung itu,  
*the gradient function of the curve,*
- (ii) koordinat titik pusingan bagi lengkung itu,  
*the coordinates of the turning points of the curve,*

Seterusnya, tentukan sama ada setiap titik pusingan adalah titik maksimum atau minimum.

*Hence, determine whether each of the turning points is a maximum or minimum point.*

[6 markah]

[6 marks]

11	(a)	(i) $3x^2 - 4x$	N1
		(ii) $3x^2 - 4x = 0$ & selesaikan	K1
		$(0, 0)$ dan $\left(\frac{4}{3}, -\frac{32}{27}\right)$	N1
		$\frac{d^2y}{dx^2} = 6(*0) - 4 = -4 < 0$ atau $\frac{d^2y}{dx^2} = 6 \left(\frac{4}{3}\right) - 4 = 4 > 0$	K1
		$(0, 0)$ titik maksimum	N1
		$\left(\frac{4}{3}, -\frac{32}{27}\right)$ titik minimum	N1

(b) Jika tangen kepada lengkung pada titik  $A(2, 0)$  dan tangen kepada lengkung pada titik  $P$  adalah selari, cari koordinat titik  $P$ . [4 markah]

*If the tangents to the curve at point  $A(2, 0)$  and a point  $P$  are parallel, find the coordinates of point  $P$ .* [4 marks]

(b)	$\frac{dy}{dx} = 3(2)^2 - 4(2)$	K1
	$3x^2 - 4x = 4$ & selesaikan	K1
	$x = -\frac{2}{3}$	N1
	$P\left(-\frac{2}{3}, -\frac{32}{27}\right)$	N1