MODUL TOPIKAL
SOALAN PERCUBAAN SPM 2023

TOPIK TINGKATAN 5

BAB 2

PEMBEZAAN
(DIFFERENTIATION)

SUMBER SOALAN:

SOALAN – SOALAN PERCUBAAN

TERENGGANU
NEGERI SEMBILAN
KELANTAN
SABAH
SBP
MELAKA
SELANGOR SET 1
PERAK

SKEMA JAWAPAN

DISUSUN OLEH:

PN. NOORUL HUDA BINTI MOHD HASHIM
(SMK TAMAN TASIK, TAIPING)

PN ZAINAB BINTI ABD RAHMAN
(SMK CONVENT, TAIPING)

SOALAN 1 : SOALAN PERCUBAAN SPM NEGERI TERENGGANU 2023 (KERTAS 1)

9	(a) (i) 7	N1	6
	(ii) $a^2 - 8a + 7 = -5$ dan $(a-6)(a-2) = 0$	K1	
	$a = 2, 6$	N1	
	(b) $\delta y = \left[(x+\delta x)^2 - 8(x+\delta x) + 7\right] - \left[x^2 - 8x + 7\right]$ atau setara	K1	
	(δy dan ganti $\left[x^2 - 8x + 7\right]$		
	$\frac{dy}{dx} = had\ \underset{\delta x \to 0}{} 2x + \delta x - 8$ dan $\frac{dy}{dx} = 2x + 0 - 8$	K1	
	$\frac{dy}{dx} = 2x - 8$	N1	

SOALAN 2 : SOALAN PERCUBAAN SPM NEGERI TERENGGANU 2023 (KERTAS 2)

11	(a)	(i) $3x^2 - 4x$	N1	10
		(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)	$\frac{dy}{dx} = 3(2)^2 - 4(2)$	K1	
		$3x^2 - 4x = 4$ & selesaikan	K1	
		$x = -\frac{2}{3}$	N1	
		$P\left(-\frac{2}{3}, -\frac{32}{27}\right)$	N1	

SOALAN 3 : SOALAN PERCUBAAN SPM NEGERI SEMBILAN 2023 (KERTAS 1)

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)	$\frac{\left(-\frac{5p}{14}\right)}{5}\times 100$	K1
		Jejari berkurang $\frac{50}{7}p\%$ // $7.143\,p\,\%$	N1
			6 markah

SOALAN 4 : SOALAN PERCUBAAN SPM NEGERI SEMBILAN 2023 (KERTAS 2)

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 $\lim_{\delta x\to 0} 2ax+a\delta x$	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
		9 markah

SOALAN 5 : SOALAN PERCUBAAN SPM NEGERI KELANTAN 2023 (KERTAS 1)

11 (a)	$\frac{\delta y}{\delta x}=\frac{\delta y}{\delta u}\times\frac{\delta u}{\delta x}$ $\text{had}_{\delta x\to 0}\frac{\delta y}{\delta x}=\text{had}_{\delta u\to 0}\frac{\delta y}{\delta u}\times\text{had}_{\delta x\to 0}\frac{\delta u}{\delta x}$ $\frac{dy}{dx}=\frac{dy}{du}\times\frac{du}{dx}$	K1 K1 N1	
11 (b)	$\frac{dy}{dx}=10t+2$ or $\frac{dx}{dt}=-2$ $\frac{dy}{dx}=(10t+2)\times\frac{1}{-2}$ $\frac{dy}{dx}=\frac{5x-7}{2}$	K1 K1 N1	6

SOALAN 6 : SOALAN PERCUBAAN SPM NEGERI SABAH 2023 (KERTAS 2)

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	10
	b) Bezakan L terhadap r $\frac{dL}{dr}=3\pi\left(2r-\frac{54}{r^2}\right)$ Samakan $\frac{dL}{dr}$ dengan 0 **&** Selesaikan untuk r $3\pi\left(2r-\frac{54}{r^2}\right)=0$ 81π	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) $\frac{dL}{dr}=(6.002-6)\times\frac{63}{2}\pi$ 0.063π	K1 N1	

SOALAN 7 : SOALAN PERCUBAAN SPM SBP 2023 (KERTAS 1)

9(a) Bezakan $y = 2x^2 + x + 1$ terhadap x & Ganti $x = 2$ — 4

$\frac{dy}{dx} = 4(2) + 1$ **K1**

Guna $m_1 \times m_2 = -1$

$m = -\frac{1}{9}$ **K1**

Guna $y - y_1 = m(x - x_1)$ **ATAU** Guna $y = mx + c$ & selesaikan untuk c

$y - 11 = -\frac{1}{9}(x - 2)$ $11 = -\frac{1}{9}(2) + c$ **K1**

$y = -\frac{1}{9}x + \frac{101}{9}$ **N1**

(b) Menyamakan persamaan — 2

$-\frac{1}{9}x + \frac{101}{9} = 2x^2 + x + 1$ **K1**

$\left(-\frac{23}{9}, 11\frac{41}{81}\right)$ @ setara **N1** — 6

Untuk Kegunaan Pemeriksa Kertas Jawapan
(Guru SBP Sahaja)

SOALAN 8 : SOALAN PERCUBAAN SPM SBP 2023 (KERTAS 2)

10(a)	$2x = 100 - 6y - 2\pi y$ **P1** $\pi y^2 + 2y(100 - 6y - 2\pi y)$ **K1** $y(200 - 3\pi y - 12y)$ **N1**	3	
(b)	$\frac{dL}{dy} = 200 - 24y - 6\pi y$ dan $200 - 24y - 6\pi y = 0$ **K1** $y = 4.667$ **N1** $L = 200(4.667) - 12(4.667)^2 - 3\pi(4.667)$ **K1** 466.72 **N1**	4	
(c)	$\frac{dL}{dt} = (200 - 24y - 6\pi y) \times 0.7$ **K1** $(200 - 24(12) - 6\pi(12)) \times 0.7$ **K1** –219.96 **N1**	3	
			10

Untuk Kegunaan Pemeriksa (Kertas Jawapan Guru SBP Sahaja)

SOALAN 9 : SOALAN PERCUBAAN SPM NEGERI MELAKA 2023 (KERTAS 1)

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)

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	/	–	/
Lakaran Graf			

1

1

$P(0, 4)$ ialah titik lengkok balas.

4

SOALAN 10 : SOALAN PERCUBAAN SPM NEGERI MELAKA 2023 (KERTAS 2)

4 (a) (i)	$y + \partial y = 2\sqrt{x + \partial x}$ $\partial y = 2\sqrt{x + \partial x} - 2\sqrt{x}$ $\partial y = \left(2\sqrt{x + \partial x} - 2\sqrt{x}\right) \times \frac{\left(2\sqrt{x + \partial x} + 2\sqrt{x}\right)}{\left(2\sqrt{x + \partial x} + 2\sqrt{x}\right)}$ $= \frac{4\partial x}{\left(2\sqrt{x + \partial x} + 2\sqrt{x}\right)}$ $\underset{\partial x \to 0}{\text{had}} \quad \frac{\partial y}{\partial x} = \frac{4}{\left(2\sqrt{x + \partial x} + 2\sqrt{x}\right)}$ $\frac{dy}{dx} = \frac{1}{\sqrt{x}}$	1 1 1	**8**
(a) ii	$\partial y = \frac{1}{\sqrt{25}} \times (0.04)$ $\partial y = 0.008$	1 1	
(b)	$\frac{\partial V}{\partial j} = 2\pi j^2$ $-1.02\pi = 2\pi j^2 \times (-0.1)$ $j = 2.258cm$	1 1 1	

SOALAN 11 : SOALAN PERCUBAAN SPM NEGERI SELANGOR SET 1 2023 (KERTAS 1)

13	(*a*)	(i)	Guna petua rantai $\frac{dL}{dt} = 4 - 2t, \quad \frac{dx}{dt} = 6$ $\frac{dL}{dx} = (4 - 2t)\left(\frac{1}{6}\right)$ $\frac{2 - t}{3}$	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	
					8

SOALAN 12 : SOALAN PERCUBAAN SPM NEGERI SELANGOR SET 1 2023 (KERTAS 2)

5	(a)		Bezakan s terhadap t $\frac{ds}{dt} = t^2 - 6t + 8$ Ganti $t = 2.4$ ke dalam pembezaan $(2.4)^2 - 6(2.4) + 8$ -0.64 // $-\frac{16}{25}$	K1 N1	
	(b)		$\frac{ds}{dt} = 0$ Selesaikan persamaan kuadratik secara pemfaktoran atau formula $t^2 - 6t + 8 = 0$ $t = 2,4$ Gantikan $t = 2\,,4$ ke dalam s $s = \frac{38}{3} @ \frac{124}{3}$ Kedudukan paling rendah $\frac{38}{3}$ & Puncak bukit $\frac{124}{3}$	 K1 K1 N1	
	(c)		Bezakan $\frac{ds}{dt}$ terhadap t $\frac{d^2s}{dt^2} = 2t - 6$ Apabila $t = 2\,, \frac{d^2s}{dt^2} = -2 < 0$ & Apabila $t = 4\,, \frac{d^2s}{dt^2} = 2 > 0$	K1 K1	
			$\frac{38}{3}$ kedudukan maksimum $\frac{124}{3}$ kedudukan minimum	N1 N1	
					9

SOALAN 13 : SOALAN PERCUBAAN SPM NEGERI PERAK 2023 (KERTAS 1)

1	$had_{x\to -2}\left(\frac{x+2}{\sqrt{5x+14}-2}\right)\left(\frac{\sqrt{5x+14}+2}{\sqrt{5x+14}+2}\right)$	1	4
	$had_{x\to -2}\frac{(x+2)\left(\sqrt{5x+14}+2\right)}{(5x+14)+2\sqrt{5x+14}-2\sqrt{5x+14}-4}$	1	
	$had_{x\to -2}\frac{(x+2)\left(\sqrt{5x+14}+2\right)}{5(x+2)}$		
	$\frac{\sqrt{5(-2)+14}+2}{5}$	1	
	$\frac{4}{5}$	1	

SOALAN 14 : SOALAN PERCUBAAN SPM NEGERI PERAK 2023 (KERTAS 1)

14	(a)	$216\pi = (\frac{1}{2})4\pi r^2 + 2\pi rh$ $h = \frac{108-r^2}{r}$ $V = \left(\frac{1}{2}\right)\left(\frac{4}{3}\pi r^3\right) + \pi r^2\left(\frac{108-r^2}{r}\right)$ $V = 108\pi r - \frac{1}{3}\pi r^3$	1 1	8
	(b)	$\frac{dV}{dr} = 108\pi - \pi r^2$ $108\pi - \pi r^2 = 0$ $r = 10.39$	1 1 1	
	(c)	$A = 2\,(3.142)(10.39)^2$ $A = 678.37$ Kos = 678.37 x RM15 Kos = RM10176	1 1 1	

SOALAN 15 : SOALAN PERCUBAAN SPM NEGERI PERAK 2023 (KERTAS 2)

6	(a)		$y = x^2(6 - x) + 5 = 6x^2 - x^3 + 5$ $\frac{dy}{dx} = 12x - 3x^2$ Fungsi kecerunan $= 12x - 3x^2$	1	
	(b)		Pada titik pusingan, $\frac{dy}{dx} = 0$ $12x - 3x^2 = 0$ $3x(4 - x) = 0$ $3x = 0, \quad 4 - x = 0$ $x = 0, \quad x = 4$ Apabila $x = 0$, $y = 0 - 0 + 5$ $= 5$ Apabila $x = 4$, $y = 6(4)^2 - 4^3 + 5$ $= 37$ Titik pusingan ialah, $(0, 5) dan (4, 37)$	1 1 1 1	8
NO.			BUTIRAN	MARKAH	JUMLAH
	(c)		$\frac{d^2y}{dx^2} = 12 - 6x$ Apabila $x = 0$, $\frac{d^2y}{dx^2} = 12 - 6(0)$ $= 12 > 0$ Maka, (0, 5) ialah titik minimum. Apabila $x = 4$, $\frac{d^2y}{dx^2} = 12 - 6(4)$ $=- 12 < 0$ Maka, (4, 37) ialah titik maksimum.	1 1 1	