



**MAJLIS PENGETUA SEKOLAH MALAYSIA (MPSM)
NEGERI PERAK**

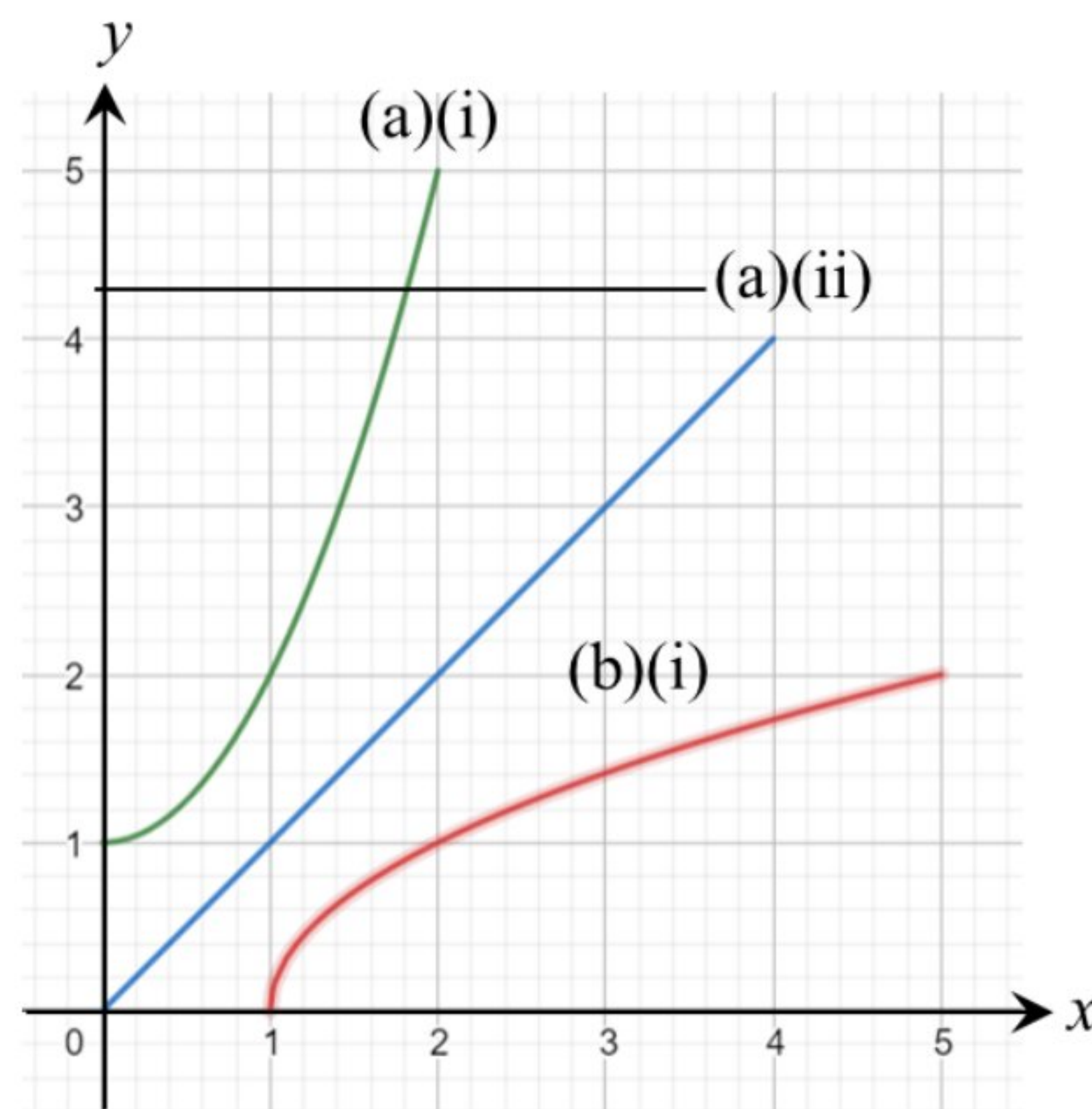
**MODUL KECEMERLANGAN SPM 2023
SET 1**

**MATEMATIK TAMBAHAN
KERTAS 2
SKEMA JAWAPAN**

NO.	BUTIRAN	MARKAH	JUMLAH
BAHAGIAN A			
1	$y = \frac{1}{2}x \quad // \quad x = 2y$ $x^2 + 2x\left(\frac{1}{2}x\right) + 2\left(\frac{1}{2}x\right)^2 - 80x - 120\left(\frac{1}{2}x\right) + 1936 = 0$ <p style="text-align: center;">@</p> $(2y)^2 + 2(2y)y + 2y^2 - 80(2y) - 120y + 1936 = 0$ $\frac{5}{2}x^2 - 140x + 1936 = 0 \quad @$ $10y^2 - 280y + 1936 = 0$ $5y^2 - 140y + 968 = 0$ $y = \frac{-(-140) \pm \sqrt{(-140)^2 - 4(5)(968)}}{2(5)}$ $x = 31.098, 24.902 \quad @ \quad y = 15.549, 12.451$ $y = 15.549, 12.451 \quad @ \quad x = 31.098, 24.902$ <p style="text-align: center;">Selamat mengulangkaji dari telegram@soalanpercubaanspm</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>

NO.	BUTIRAN		MARKAH	JUMLAH
2		$P = \int \frac{dP}{dV} dV$ $P = \frac{3V^3}{3} - \frac{12V^6}{6} + c$ $P = V^3 - 2V^6 + c$ <p>Sub the values of $V = 1$ and $P = 8$</p> $(8) = (1)^3 - 2(1)^6 + c$ $P = V^3 - 2V^6 + 9$ <p>Sub the value of $V = 0.2$</p> $P = (0.2)^3 - 2(0.2)^6 + 9$ $P = 9.008$	1 1 1 1 1	6

NO.	BUTIRAN		MARKAH	JUMLAH
3	(a)	i		
		ii	1	
			1	
	(b)	i	1	
		ii	1	
			1	7



ii Rujuk (a)(i)

Lukis garis mengufuk yang memotong graf di a(i)

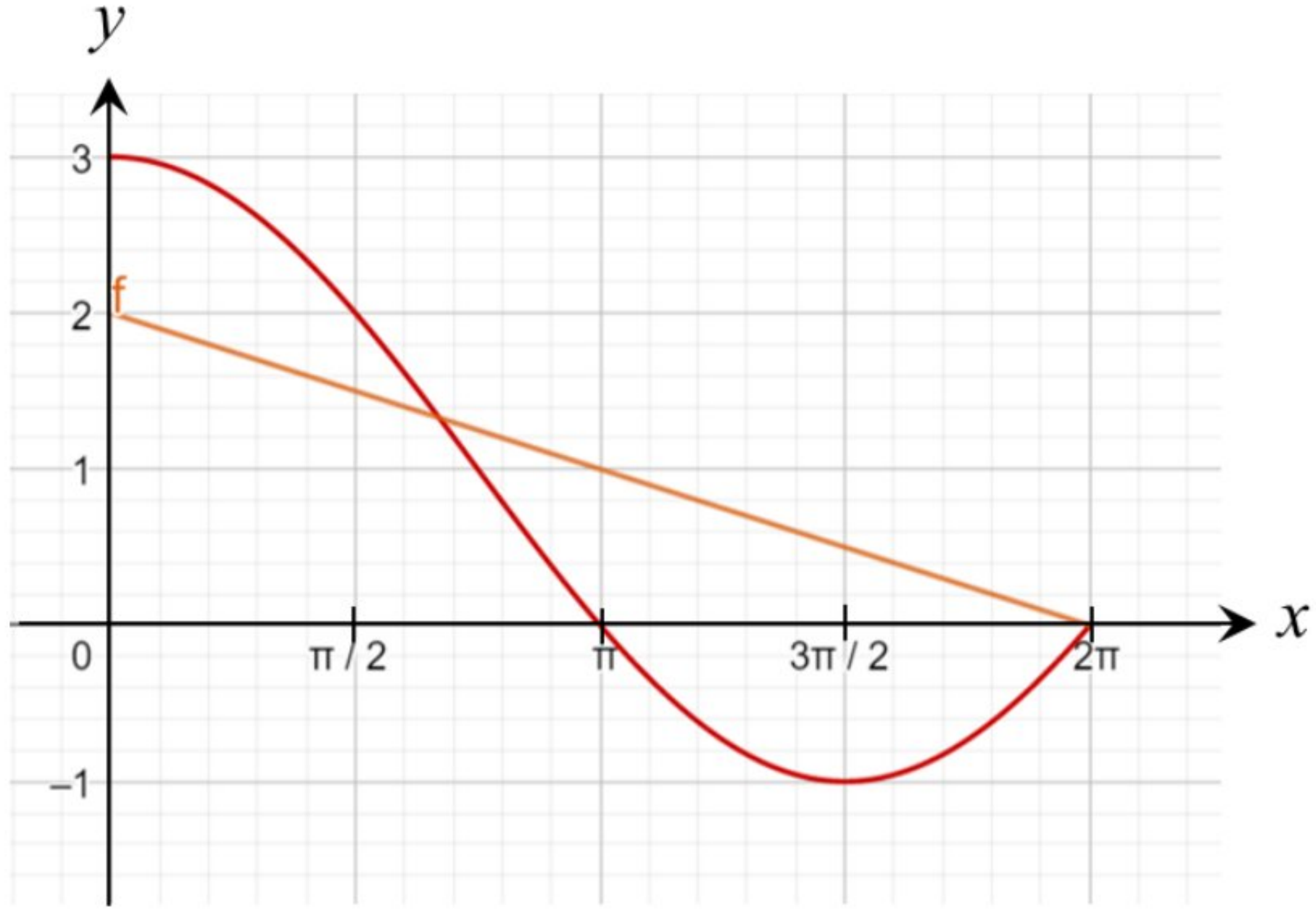
Fungsi songsang untuk f wujud sebab berjaya dalam ujian garisan mengufuk/ garis mengufuk hanya memotong graf hanya di satu titik di mana-mana bahagian

(b) i Lukis garis lurus $y=x$

Lakar graf b(i) [rujuk rajah]

ii $f(x) = \sqrt{x-1}$ atau $f : x \rightarrow \sqrt{x-1}$

NO.	BUTIRAN		MARKAH	JUMLAH
	iii	$0 \leq y \leq 2$	1	
4	(a)	$\frac{y-4}{x-(-2)} = \frac{10-4}{10-(-2)} \text{ atau}$ $y = \frac{1}{2}x + c \text{ dan mencari nilai } c=5$ $y = \frac{1}{2}x + 5$	1 1	9
	(b)	$y = -2x + 20$ $-2x + 20 = \frac{1}{2}x + 5$ (6,8)	1 1 1	
	(c)	$\frac{n(-2) + m(10)}{m+n} = 6 \text{ atau } \frac{n(4) + m(10)}{m+n} = 8$ * boleh gunakan selain m dan n * m dan n boleh saling bertukar 2:1	1 1	
	(d)	$\frac{1}{2} [(3)(4) + (-2)(-10) + (15)(10) + (10)(14)] $ $- [(14)(-2) + (4)(15) + (-10)(10) + (10)(3)] $ 180unit ²	1 1	
NO.	BUTIRAN		MARKAH	JUMLAH
5	(a)	i	$\frac{m^{xy+2x-xy+yz-xz-yz}}{m^{2x-xz}}$	1 1
		ii	$3^n(3^2 - 1 + \frac{10}{3}) = k(3^n)$ $11\frac{1}{3} / \frac{34}{3}$	1 1
	(b)	i	$h = \frac{2(10+8\sqrt{2})}{4+3\sqrt{2}} \times \frac{4-3\sqrt{2}}{4-3\sqrt{2}}$ $= 8 - 2\sqrt{2}$	1 1
		ii	$\sqrt{(8-2\sqrt{2})^2 + (4+3\sqrt{2})^2}$ 9.73 cm	1 1
NO.	BUTIRAN		MARKAH	JUMLAH
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	8

	(b)	<p>Pada titik pusingan,</p> $\frac{dy}{dx} = 0$ $12x - 3x^2 = 0$ $3x(4 - x) = 0$ $3x = 0, \quad 4 - x = 0$ $x = 0, \quad x = 4$ <p>Apabila $x = 0, y = 0 - 0 + 5$ $= 5$</p> <p>Apabila $x = 4, y = 6(4)^2 - 4^3 + 5$ $= 37$</p> <p>Titik pusingan ialah, $(0, 5)$ dan $(4, 37)$</p>	1 1 1 1	
	(c)	$\frac{d^2y}{dx^2} = 12 - 6x$ <p>Apabila $x = 0, \frac{d^2y}{dx^2} = 12 - 6(0)$ $\frac{d^2y}{dx^2} = 12 > 0$</p> <p>Maka, $(0, 5)$ ialah titik minimum.</p> <p>Apabila $x = 4, \frac{d^2y}{dx^2} = 12 - 6(4)$ $\frac{d^2y}{dx^2} = -12 < 0$</p> <p>Maka, $(4, 37)$ ialah titik maksimum.</p>	1 1 1	
NO.	BUTIRAN	MARKAH	JUMLAH	
7	<p>(a)</p>  <p>Bentuk graf kosinus $\frac{2}{3}$ kitaran untuk $0 \leq x \leq 2\pi$ Amplitud graf = 2 unit Graf dianjak 1 unit dari paksi-x</p>	1 1 1 1	7	

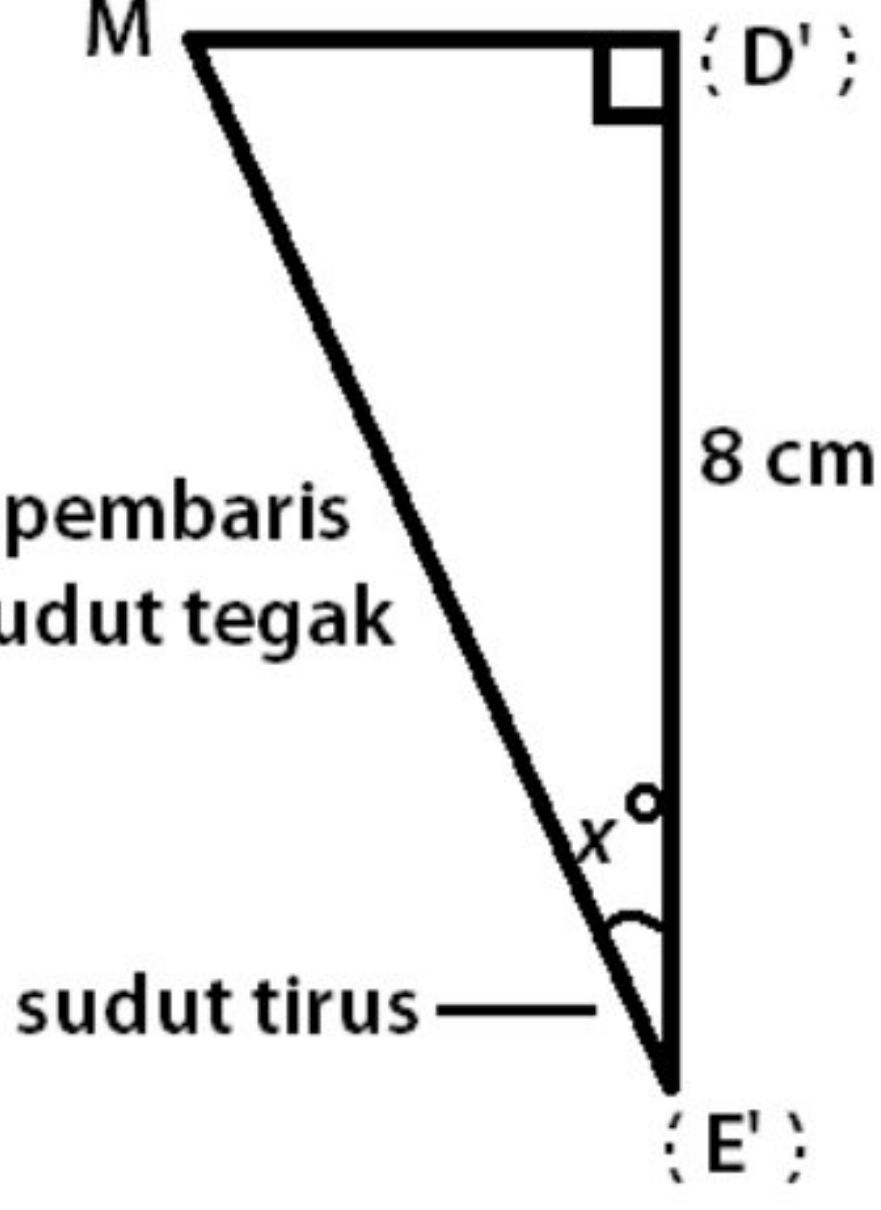
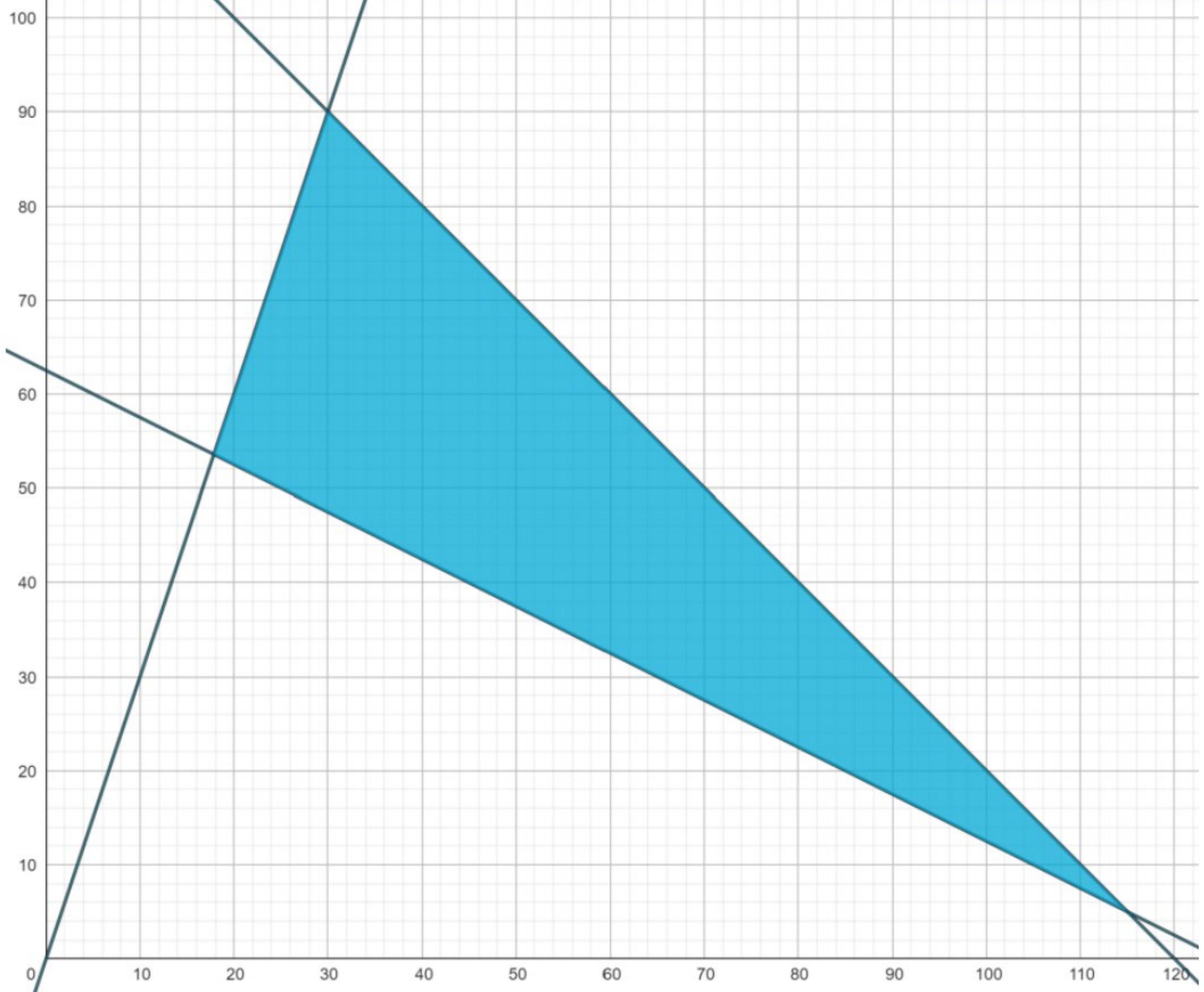
	(b)	$y = 2 - \frac{x}{\pi}$ <p>Lakar $y = 2 - \frac{x}{\pi}$ menggunakan paksi-paksi (a)</p> <p>Bilangan penyelesaian= 2</p>	1 1 1		
NO.	BUTIRAN		MARKAH	JUMLAH	
BAHAGIAN B					
8	(a)	<p>K (0, 4) and M (3, 0) and</p> <p>Jarak PK / PM / KM :</p> $\sqrt{(3.5 - 0)^2 + (3.5 - 4)^2} / \sqrt{(3.5 - 3)^2 + (3.5 - 0)^2} / \sqrt{4^2 + 3^2}$ $(5)^2 = (\sqrt{12.5})^2 + (\sqrt{12.5})^2 - 2(\sqrt{12.5})(\sqrt{12.5}) \cos \angle KPM$ $\angle KPM = 90^\circ = \frac{\pi}{2} \text{ radian}$	1 1 1		
	(b)	i	$s_Q = (\sqrt{12.5})\left(\frac{\pi}{2}\right) // s_O = \left(\frac{5}{2}\right)(\pi)$ <p>Perimeter = $s_Q + s_O$</p> <p>13.409 unit</p>	1 1 1	
		ii	$A_1 = \frac{1}{2}[(3.142)(2.5^2)] \text{ or } A_2 = \frac{1}{2}(\sqrt{12.5})^2 \left(\frac{3.142}{2}\right)$ $A_3 = \frac{1}{2}(\sqrt{12.5})(\sqrt{12.5})$ <p><i>Luas kawasan berlerek</i> = $A_1^* - (A_2^* - A_3^*)$</p> <p>6.25 unit²</p>	1 1 1 1	10

NO.	BUTIRAN		MARKAH	JUMLAH														
9	(a)	<table border="1"> <tr> <td>$\log_{10} x$</td> <td>0.18</td> <td>0.30</td> <td>0.48</td> <td>0.60</td> <td>0.70</td> <td>0.78</td> </tr> <tr> <td>$\log_{10} y$</td> <td>0.93</td> <td>0.78</td> <td>0.69</td> <td>0.54</td> <td>0.49</td> <td>0.36</td> </tr> </table>	$\log_{10} x$	0.18	0.30	0.48	0.60	0.70	0.78	$\log_{10} y$	0.93	0.78	0.69	0.54	0.49	0.36	1 1 1 1 1	10
$\log_{10} x$	0.18	0.30	0.48	0.60	0.70	0.78												
$\log_{10} y$	0.93	0.78	0.69	0.54	0.49	0.36												
	(b)	i	3.89 ↔ 4.07	1														
		li	$\log_{10} y = a \log_{10} x + \log_{10} b$ $a = * \text{kecerunan} // (-0.889)$ $\log_{10} b = * \text{pintasan} - \log y // 1.08$ $b = 11.75 \leftrightarrow 12.30$	1 1 1 1														
NO.	BUTIRAN		MARKAH	JUMLAH														
10	(a)	$P(X < 1900) = 0.8949 \text{ ATAU } P(X \geq 1900) = 0.1151$ $\frac{1900 - 1650}{\sigma} = 1.20$ $\sigma = 208.33$ $P\left(Z < \frac{1500 - 1650}{208.33}\right)$	1 1 1 1	10														

		$P(Z < -0.72)$ 0.2358	1	
	(b) i	$1 - P(X = 0) - P(X = 1)$ $1 - {}^7C_0(0.2358)^0(0.7642)^7 - {}^7C_1(0.2358)^1(0.7642)^6$ 0.5190	1 1 1	
	ii	$\sigma = \sqrt{(25)(0.2358)(0.7642)}$ 2.122 or 2.1225	1 1	
NO.	BUTIRAN		MARKAH	JUMLAH
11	(a)	$v_p = \binom{16}{8} \text{ or } 16\mathbf{i} + 8\mathbf{j}$ $v_q = \binom{5}{-3} \text{ or } 5\mathbf{i} - 3\mathbf{j}$ $\binom{8+16t}{2+8t} = \binom{15}{9} + t\binom{5}{-3}$ OR $8 + 16t = 15 + 5t \text{ or } 2 + 8t = 9 - 3t$ $t = \frac{7}{11} @ 0.636 \text{ jam}$	1 1 1 1	
	(b) i	$\binom{15}{9} + (1)\binom{5}{-3}$ $\overrightarrow{OA} = \binom{20}{6} \text{ OR } A(20, 6)$	1 1	10
	ii	$\overrightarrow{QA} = \overrightarrow{QO} + \overrightarrow{OA}$ $\overrightarrow{QA} = \binom{-15}{-9} + \binom{20}{6}$ $\overrightarrow{QA} = \binom{5}{-3} @ 5\mathbf{i} - 3\mathbf{j}$ $\frac{1}{\sqrt{(5)^2 + (-3)^2}} \binom{5}{-3} \text{ OR } \frac{5\mathbf{i} - 3\mathbf{j}}{\sqrt{(5)^2 + (-3)^2}}$ $\frac{1}{\sqrt{34}} \binom{5}{-3} \text{ OR } \frac{5\mathbf{i} - 3\mathbf{j}}{\sqrt{34}}$	1 1 1 1	

BAHAGIAN C

NO.	BUTIRAN		MARKAH	JUMLAH
12	(a)	$4(3) - 8$	1	10
		4 ms^{-2}	1	
	(b)	$2t^2 - 8t - 10 = 0$ & selesaikan untuk t	1	
		$S_A = 2\frac{t^3}{3} - 4t^2 - 10t$ <p align="center">DAN</p> $2\frac{(5)^3}{3} - 4(5)^2 - 10(5) \text{ ATAU } 2\frac{(6)^3}{3} - 4(6)^2 - 10(6)$ $\left -\frac{200}{3} - 0 \right + \left -60 - \left(-\frac{200}{3} \right) \right $ $\frac{220}{3} @ 73.333$	1	
(c)	$V_B = -t^2 - 7t + 4$	1		
	$2t^2 - 8t - 10 = -t^2 - 7t + 4$	1		
	$3t^2 - t - 14 = 0$			
	$(3t - 7)(t + 2) = 0$	1		
		$\frac{7}{3}$	1	
NO.	BUTIRAN		MARKAH	JUMLAH
13	(a)	i	$(\sqrt{p})^2 = (10)^2 - (8)^2$	1
		$p = 36$	1	
	ii	$(\sqrt{36})^2 = (10)^2 + (10)^2 - 2(10)(10)\cos AMB$	1	
		$\angle AMB = 34.92^\circ \text{ or } 34^\circ 55'$	1	
	$Area, A_{ABM} = \frac{1}{2}(10)(10) \sin 34.92$	1		
	28.622 cm^2	1		
Selamat mengulangkaji dari telegram@soalanpercubaanspm				

NO.	BUTIRAN	MARKAH	JUMLAH
(b)	<div style="text-align: center;">  </div> <p style="text-align: center;"> <i>sisi bertentangan, $MD' = \sqrt{(6)^2 - (3)^2}$</i> $\tan x^\circ = \frac{5.1962}{8}$ 33.00° </p>	1 1 1	
NO.	BUTIRAN	MARKAH	JUMLAH
14	<p>(a)</p> $x + y \leq 120$ $y \leq 3x$ $0.8x + 1.6y \geq 100$	1 1 1	
(b)	 <p>Paksi dan skala yang betul dengan satu garis diplot dengan betul <i>Correct axes and scales with one line correctly plotted</i></p>	1	

			Tiga garis diplot dengan betul <i>Three lines correctly plotted</i>	1	
			Rantau dilorek dengan betul <i>Correct shaded region</i>	1	
	(c)	i	60	1	
		ii	(30,90)	1	
			$0.2x + 0.3y$ $= 0.2(30) + 0.3(90)$	1	
			33	1	
NO.	BUTIRAN			MARKAH	JUMLAH
15	(a)		$\frac{3.00}{2.50} \times 100$ atau $\frac{q}{1.60} \times 100 = 150$	1	
			p= 120 q= 2.40	1 1	
	(b)		$\frac{125 \times 120}{100}$	1	
			150	1	
	(c)	i	$45+10+m+n=100$ atau $\frac{120(45) + 130m + 150n + 125(10)}{100} = 130$	1	
			Gunakan kaedah penghapusan ATAU penggantian	1	
			m=20	1	
		ii	$\frac{P_{20}+k}{P_{20}} \times 100 = 130$ atau $\frac{P_{22}}{P_{22}-k} \times 100 = 130$	1	
			$\frac{13}{3}k$	1	

SOALAN GEMPUR JPN PERAK - 2023 (SET 1 – KERTAS 2)