Penyelesaian Lengkap

PRAKTIS 2

Kertas 1

Bahagian A

1 (a) $2(x + 1 + h)^2 = 9 - x - h$

Apabila/*When* $x = -3$,

$$\begin{aligned} 2[(-3) + 1 + h]^2 &= 9 - (-3) - h \\ 2(h - 2)^2 &= 12 - h \\ 2(h^2 - 4h + 4) &= 12 - h \\ 2h^2 - 8h + 8 &= 12 - h \\ 2h^2 - 7h - 4 &= 0 \\ (2h + 1)(h - 4) &= 0 \\ h = -\frac{1}{2}, \quad h &= 4 \end{aligned}$$

(b)
$$\begin{aligned} 5x + 3x^2 &= 2 \\ 3x^2 + 5x - 2 &= 0 \\ x^2 + \frac{5}{3}x - \frac{2}{3} &= 0 \end{aligned}$$

Hasil tambah punca:
Sum of roots:

$$\alpha + \beta = -\left(\frac{5}{3}\right) = -\frac{5}{3}$$

Hasil darab punca/*Product of roots*:

$$\alpha\beta = -\frac{2}{3}$$

Hasil tambah punca baharu:
Sum of new roots:

$$\begin{aligned} (6\alpha - 1) + (6\beta - 1) &= 6(\alpha + \beta) - 2 \\ &= 6\left(-\frac{5}{3}\right) - 2 \\ &= -12 \end{aligned}$$

Hasil darab punca baharu:
Product of new roots:

$$\begin{aligned} (6\alpha - 1)(6\beta - 1) &= 36\alpha\beta - 6\alpha - 6\beta + 1 \\ &= 36\alpha\beta - 6(\alpha + \beta) + 1 \\ &= 36\left(-\frac{2}{3}\right) - 6\left(-\frac{5}{3}\right) + 1 \\ &= -13 \end{aligned}$$

Persamaan baharu ialah
New equation is

$$\begin{aligned} x^2 - (-12)x + (-13) &= 0 \\ x^2 + 12x - 13 &= 0 \end{aligned}$$

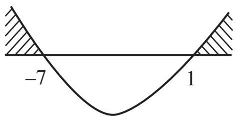
2 (a) $x = -\frac{4}{3}, \qquad x = \frac{5}{2}$

$$\begin{aligned} 3x + 4 = 0, 2x - 5 &= 0 \\ (3x + 4)(2x - 5) &= 0 \\ 6x^2 - 15x + 8x - 20 &= 0 \\ 6x^2 - 7x - 20 &= 0 \\ a = 6, b = -7, c &= -20 \end{aligned}$$

(b) $x + 2y = 3 \Rightarrow y = \frac{3 - x}{2}$

Gantikan ke dalam $x^2 + 1 > 2y^2$,
Substitute into $x^2 + 1 > 2y^2$,

$$\begin{aligned} x^2 + 1 &> 2\left(\frac{3 - x}{2}\right)^2 \\ x^2 + 1 &> 2\left(\frac{9 - 6x + x^2}{4}\right) \\ x^2 + 1 &> \frac{9 - 6x + x^2}{2} \\ 2x^2 + 2 &> 9 - 6x + x^2 \\ x^2 + 6x - 7 &> 0 \\ (x + 7)(x - 1) &> 0 \end{aligned}$$



$\therefore x < -7, x > 1$

3
$$\begin{aligned} x^2 + 4x - 8 &= x(1 - x) - 2 \\ x^2 + 4x - 8 &= x - x^2 - 2 \\ 2x^2 + 3x - 6 &= 0 \\ x^2 + \frac{3}{2}x - 3 &= 0 \\ x^2 + \frac{3}{2}x + \left(\frac{3}{4}\right)^2 - \left(\frac{3}{4}\right)^2 - 3 &= 0 \\ \left(x + \frac{3}{4}\right)^2 - \frac{9}{16} - 3 &= 0 \\ \left(x + \frac{3}{4}\right)^2 - \frac{57}{16} &= 0 \\ \left(x + \frac{3}{4}\right)^2 &= \frac{57}{16} \\ x + \frac{3}{4} &= \pm\frac{\sqrt{57}}{4} \end{aligned}$$

$$x = -\frac{\sqrt{57}}{4} - \frac{3}{4}, x = \frac{\sqrt{57}}{4} - \frac{3}{4}$$

$x = -2.637, x = 1.137$

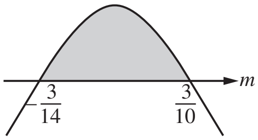
4
$$\begin{aligned} p^2 - 2x + 1 &= px - x^2 \\ x^2 - 2x - px + p^2 + 1 &= 0 \\ x^2 - (2 + p)x + p^2 + 1 &= 0 \end{aligned}$$

$a = 1, b = -(2 + p), c = p^2 + 1$

$$\begin{aligned} b^2 - 4ac &= 0 \\ [-(2 + p)]^2 - 4(1)(p^2 + 1) &= 0 \\ 4 + 4p + p^2 - 4p^2 - 4 &= 0 \\ -3p^2 + 4p &= 0 \\ p(3p - 4) &= 0 \\ p = 0, 3p - 4 &= 0 \\ p = 0, \quad p &= \frac{4}{3} \end{aligned}$$

5 $9m^2x^2 + (2m + 3)x + 4 = 0$
$a = 9m^2, b = 2m + 3, c = 4$

$$b^2 - 4ac \geqslant 0$$
$$(2m + 3)^2 - 4(9m^2)(4) \geqslant 0$$
$$(2m + 3)^2 - 144m^2 \geqslant 0$$
$$[(2m + 3) + 12m][(2m + 3) - 12m] \geqslant 0$$
$$(14m + 3)(3 - 10m) \geqslant 0$$



$\therefore -\frac{3}{14} \leqslant m \leqslant \frac{3}{10}$

6 (a) $x^2 - 2mx + 9n^2 = 0$
$a = 1, b = -2m, c = 9n^2$

$$(-2m)^2 - 4(1)(9n^2) = 0$$
$$4m^2 - 36n^2 = 0$$
$$4m^2 = 36n^2$$
$$2m = 6n$$
$$m = 3n$$

(b) $3x^2 - 2x + 1 = 0$
$a = 3, b = -2, c = 1$

$$b^2 - 4ac = (-2)^2 - 4(3)(1)$$
$$= 4 - 12$$
$$= -8$$

Oleh sebab $b^2 - 4ac < 0$, maka persamaan kuadratik $3x^2 - 2x + 1 = 0$ tidak mempunyai punca nyata.
Since $b^2 - 4ac < 0$, *thus the quadratic equation* $3x^2 - 2x + 1 = 0$ *does not have real roots.*

7 (a) $m = 3, n = 11$
$y = p(x - 3)^2 + 11$
Pada titik (0, 8),
At point (0, 8),

$$8 = p(0 - 3)^2 + 11$$
$$9p = -3$$
$$p = -\frac{1}{3}$$

(b) $x = 3$

8 (a) $p = \frac{5}{2}, q = -18$

$$y = n\left(x - \frac{5}{2}\right)^2 - 18$$

Pada titik (0, −15)/*At point* (0, −15),

$$-15 = n\left(0 - \frac{5}{2}\right)^2 - 18$$
$$\frac{25}{4}n = 3$$
$$n = \frac{12}{25}$$

(b) $x = \frac{5}{2}$

9 (a) $f(x) = 6 + m - 3(x + n)^2$
$f(x) = -3(x + n)^2 + 6 + m$

Pada titik maksimum $(-4, 2n + 5)$,
At maximum point $(-4, 2n + 5)$,

$$(-4) + n = 0$$
$$n = 4$$
$$6 + m = 2n + 5$$
$$6 + m = 2(4) + 5$$
$$m = 7$$

(b) $f(x) = 6 + (7) - 3(x + 4)^2$
$= 13 - 3(x + 4)^2$

Apabila/*When* $f(x) = 0$,

$$13 - 3(x + 4)^2 = 0$$
$$13 - 3(x^2 + 8x + 16) = 0$$
$$13 - 3x^2 - 24x - 48 = 0$$
$$-3x^2 - 24x - 35 = 0$$

$b^2 - 4ac$
$= (-24)^2 - 4(-3)(-35)$
$= 156$ (positif/*poitive*)

Maka, $b^2 - 4ac > 0$ dan $f(x)$ mempunyai dua punca berbeza.
Thus, $b^2 - 4ac > 0$ *and* $f(x)$ *has two different roots.*

10 (a) $m = -2$
(b) Hasil darab punca/*Product of roots*:

$$\alpha(\alpha + 6) = -8$$
$$\alpha^2 + 6\alpha + 8 = 0$$
$$(\alpha + 4)(\alpha + 2) = 0$$
$$\alpha = -4, \quad \alpha = -2$$

Jika $\alpha = -4$,
punca-punca ialah −4 dan −4 + 6 iaitu −4 dan 2.
Punca-punca −4 dan 2 tidak sepadan dengan graf.
Jika $\alpha = -2$,
punca-punca ialah −2 dan −2 + 6 iaitu −2 dan 4.
Punca-punca −2 dan 4 adalah sepadan dengan graf.
If $\alpha = -4$,
the roots are −4 *and* −4 + 6 *that are* −4 and 2.
The roots −4 *and* 2 *do not correspond to the graph.*
If $\alpha = -2$,
the roots are −2 *and* −2 + 6 *that are* −2 *and* 4.
The roots −2 *and* 4 *correspond to the graph.*

$$w(x) = h + kx - 3x^2$$
$$w(-2) = h + k(-2) - 3(-2)^2$$
$$0 = h - 2k - 12$$
$$h - 2k = 12 \ldots ①$$
$$w(4) = h + k(4) - 3(4)^2$$
$$0 = h + 4k - 48$$
$$h + 4k = 48 \ldots ②$$
$$② - ①: \ 6k = 36$$
$$k = 6$$

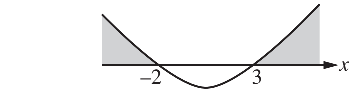
Daripada/*From* ①,

$$h - 2(6) = 12$$
$$h = 24$$

Bahagian B

11 (a)

$$(x + 4)(x - 3) \geqslant 2x - 6$$
$$(x + 4)(x - 3) \geqslant 2(x - 3)$$
$$(x + 4)(x - 3) - 2(x - 3) \geqslant 0$$
$$(x - 3)(x + 4 - 2) \geqslant 0$$
$$(x - 3)(x + 2) \geqslant 0$$



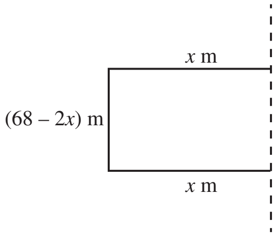
$\therefore x \leqslant -2, x \geqslant 3$

(b) (i) Biar lebar kawasan itu ialah w.
Let the width of the area is w.

$$\therefore x + x + w = 68$$
$$w = 68 - 2x$$

Biar luas kawasan dipagar ialah A.
Let the area covered by fence is A.

$$A = x(68 - 2x)$$
$$A = 68x - 2x^2$$



(ii)
$$\begin{aligned} A &= -2x^2 + 68x \\ &= -2[x^2 - 34x] \\ &= -2\left[x^2 - 34x + \left(\frac{34}{2}\right)^2 - \left(\frac{34}{2}\right)^2\right] \\ &= -2[(x - 17)^2 - 289] \\ &= -2(x - 17)^2 + 578 \end{aligned}$$

$a = -2 < 0$, A bernilai maksimum.

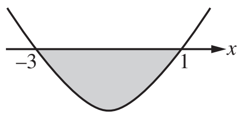
Nilai maksimum bagi A ialah 578 m^2 apabila $x = 17$.

$a = -2 < 0$, A is maximum.

The maximum value of A is 578 m^2 *when* $x = 17$.

12 (a)
$$\begin{aligned} 3x^2 + 7x - 6 &= 4 \\ 3x^2 + 7x - 10 &= 0 \\ (3x + 10)(x - 1) &= 0 \\ 3x + 10 = 0, x - 1 &= 0 \\ x = -\frac{10}{3}, x &= 1 \end{aligned}$$

(b)
$$\begin{aligned} 3x^2 + 7x - 6 &< x + 3 \\ 3x^2 + 6x - 9 &< 0 \\ x^2 + 2x - 3 &< 0 \\ (x + 3)(x - 1) &< 0 \end{aligned}$$



$\therefore -3 < x < 1$

(c)
$$\begin{aligned} g(x) &= 3x^2 + 7x - 6 \\ &= 3\left[x^2 + \frac{7}{3}x - 2\right] \\ &= 3\left[x^2 + \frac{7}{3}x + \left(\frac{7}{6}\right)^2 - \left(\frac{7}{6}\right)^2 - 2\right] \\ &= 3\left[\left(x + \frac{7}{6}\right)^2 - \frac{121}{36}\right] \\ &= 3\left(x + \frac{7}{6}\right)^2 - \frac{121}{12} \end{aligned}$$

$a = 3 > 0$, $g(x)$ bernilai minimum.

Apabila $x + \frac{7}{6} = 0$, $x = -\frac{7}{6}$

Nilai minimum $= -\frac{121}{12}$

Titik pusingan ialah $\left(-\frac{7}{6}, -\frac{121}{12}\right)$.

$a = 3 > 0$, $g(x)$ is minimum.

When $x + \frac{7}{6} = 0$, $x = -\frac{7}{6}$

Minimum value $= -\frac{121}{12}$

The turning point is $\left(-\frac{7}{6}, -\frac{121}{12}\right)$.

Kertas 2

Bahagian A

1 (a)
$$\begin{aligned} px^2 + 8x + q &= 2 \\ px^2 + 8x + q - 2 &= 0 \\ a = p, b = 8, c &= q - 2 \\ b^2 - 4ac &= 0 \\ (8)^2 - 4(p)(q - 2) &= 0 \\ 64 - 4p(q - 2) &= 0 \\ 16 - p(q - 2) &= 0 \\ 16 &= p(q - 2) \\ p &= \frac{16}{q - 2} \end{aligned}$$

(b)
$$\begin{aligned} 6 - x^2 - 8x &= k \\ x^2 + 8x + k - 6 &= 0 \\ a = 1, b = 8, c &= k - 6 \\ b^2 - 4ac &< 0 \\ (8)^2 - 4(1)(k - 6) &< 0 \\ 64 - 4(k - 6) &< 0 \\ 64 - 4k + 24 &< 0 \\ -4k &< -88 \\ 4k &> 88 \\ k &> 22 \end{aligned}$$

2 (a)
$$\begin{aligned} 2x^2 - 6x - 8 &= 0 \\ x^2 - 3x - 4 &= 0 \end{aligned}$$

Hasil tambah punca/*Sum of roots*
$= \alpha + \beta = 3$

Hasil darab punca/*Product of roots*
$= \alpha\beta = -4$

Hasil tambah punca baharu:
Sum of new roots:

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = -\frac{3}{4}$$

Hasil darab punca baharu:
Product of new roots:

$$\frac{1}{\alpha} \times \frac{1}{\beta} = \frac{1}{\alpha\beta} = -\frac{1}{4}$$

Persamaan kuadratik baharu ialah
New quadratic equation is

$$\begin{aligned} x^2 - \left(-\frac{3}{4}\right)x - \frac{1}{4} &= 0 \\ 4x^2 + 3x - 1 &= 0 \end{aligned}$$

(b) $f(x) = (x - 6)(2 - x)$
$= 2x - x^2 - 12 + 6x$
$= -x^2 + 8x - 12$

Tangen/*Tangent*: $y = mx - 3$

$$mx - 3 = -x^2 + 8x - 12$$
$$x^2 + (m - 8)x + 9 = 0$$
$$b^2 - 4ac = 0$$
$$(m - 8)^2 - 4(1)(9) = 0$$
$$[(m - 8) + 6][(m - 8) - 6] = 0$$
$$(m - 2)(m - 14) = 0$$
$m = 2$ atau/*or* $m = 14$

3 (a)
$$x(4x - 3) - 9 = x + x(-2x) + 3$$
$$4x^2 - 3x - 9 = x - 2x^2 + 3$$
$$6x^2 - 4x - 12 = 0$$
$$x^2 - \frac{2}{3}x - 2 = 0$$

Hasil tambah punca/*Sum of roots*
$= \alpha + \beta = -\left(-\frac{2}{3}\right) = \frac{2}{3}$

Hasil darab punca/*Product of roots*
$= \alpha\beta = -2$

Hasil tambah punca baharu/*Sum of new roots*
$= \left(\frac{1}{2}\alpha + 3\right) + \left(\frac{1}{2}\beta + 3\right)$
$= \frac{1}{2}(\alpha + \beta) + 6$
$= \frac{1}{2}\left(\frac{2}{3}\right) + 6$
$= \frac{19}{3}$

Hasil darab punca baharu/*Product of new roots*
$= \left(\frac{1}{2}\alpha + 3\right) + \left(\frac{1}{2}\beta + 3\right)$
$= \frac{1}{4}(\alpha\beta) + \frac{3}{2}(\alpha + \beta) + 9$
$= \frac{1}{4}(-2) + \frac{3}{2}\left(\frac{2}{3}\right) + 9$
$= \frac{19}{2}$

Persamaan kuadratik baharu
New quadratic equation
$x^2 - \left(\frac{19}{3}\right)x + \frac{19}{2} = 0$
$6x^2 - 38x + 57 = 0$
$\therefore p = 6, q = -38, r = 57$

(b) $x^2 + y^2 - 10x - 12y + 30 = 0$
Apabila/*When* $y = 0$,
$$x^2 + (0)^2 - 10x - 12(0) + 30 = 0$$
$$x^2 - 10x + 30 = 0$$
$$b^2 - 4ac = (-10)^2 - 4(1)(30)$$
$$= 100 - 120$$
$$= -20 < 0$$

Persamaan $x^2 - 10x + 30 = 0$ tidak mempunyai punca nyata.
Maka, bulatan $x^2 + y^2 - 10x - 12y + 30 = 0$ tidak melalui paksi-x.
The equation $x^2 - 10x + 30 = 0$ does not have real roots.
Thus, the circle $x^2 + y^2 - 10x - 12y + 30 = 0$ does not pass through the x-axis.

4 (a) (i) $x = \frac{30}{2} = 15 \Rightarrow x - 15 = 0$
$$f(x) = a(x - 15)^2 + \left(12 - \frac{3}{2}\right)$$
$$f(x) = a(x - 15)^2 + \frac{21}{2}$$
Daripada rajah,
From the diagram,
$f(0) = 12$
$$12 = a((0) - 15)^2 + \frac{21}{2}$$
$$\frac{3}{2} = 225a$$
$$a = \frac{1}{150}$$
$$\therefore f(x) = \frac{1}{150}(x - 15)^2 + \frac{21}{2}$$

(ii) $f(5) = \frac{1}{150}((5) - 15)^2 + \frac{21}{2}$
$= 11\frac{1}{6}$

Ketinggian layang-layang itu dari tanah mengufuk ialah $11\frac{1}{6}$ m.
The height of the kite from the horizontal ground is $11\frac{1}{6}$ m.

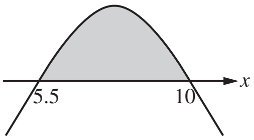
Bahagian B

5 (a) Luas ΔEFG
Area of ΔEFG
$= \frac{1}{2} \times (2x - 7) \times (12 - x)$
$= \frac{1}{2} \times (24x - 2x^2 - 84 + 7x)$
$= \frac{1}{2} \times (-2x^2 + 31x - 84)$
$= -x^2 + \frac{31}{2}x - 42$
$= -\left(x^2 - \frac{31}{2}x + 42\right)$
$= -\left[x^2 - \frac{31}{2}x + \left(-\frac{31}{4}\right)^2 - \left(-\frac{31}{4}\right)^2 + 42\right]$
$= -\left[\left(x - \frac{31}{4}\right)^2 - \frac{289}{16}\right]$
$= -\left[x - \left(-\frac{31}{4}\right)\right]^2 + \frac{289}{16}$

Luas maksimum ialah $\frac{289}{16}$ m^2.
The maximum area is $\frac{289}{16}$ m^2.

(b) Luas $\Delta EFG \geqslant 13$ m^2
Area of $\Delta EFG \geqslant 13$ m^2

$$-x^2 + \frac{31}{2}x - 42 \geqslant 13$$
$$-x^2 + \frac{31}{2}x - 55 \geqslant 0$$
$$-2x^2 + 31x - 110 \geqslant 0$$
$$(-2x + 11)(x - 10) \geqslant 0$$



$\therefore 5.5 \leqslant x \leqslant 10$

6 (a) $f(x) = (4x + 3)(x - 2)$
$$= 4x^2 - 5x - 6$$
$$= 4\left(x^2 - \frac{5}{4}x - \frac{3}{2}\right)$$
$$= 4\left[x^2 - \frac{5}{4}x + \left(-\frac{5}{8}\right)^2 - \left(-\frac{5}{8}\right)^2 - \frac{3}{2}\right]$$
$$= 4\left[\left(x - \frac{5}{8}\right)^2 - \frac{121}{64}\right]$$
$$= 4\left(x - \frac{5}{8}\right)^2 - \frac{121}{16}$$

(b) $a = 4 > 0 \Rightarrow f(x)$ ialah minimum
$f(x)$ is minimum

Nilai minimum $= -\dfrac{121}{16}$

Titik minimum bagi $f(x) = \left(\dfrac{5}{8}, -\dfrac{121}{16}\right)$

Minimum value $= -\dfrac{121}{16}$

Minimum point of $f(x) = \left(\dfrac{5}{8}, -\dfrac{121}{16}\right)$

(c) $4x^2 - 5x - 6 = mx - 10$
$$4x^2 - 5x - mx + 4 = 0$$
$$4x^2 - (5 + m)x + 4 = 0$$
$b^2 - 4ac = 0$ (Tangen/*Tangent*)
$$(5 + m)^2 - 4(4)(4) = 0$$
$$(5 + m)^2 - 64 = 0$$
$$(5 + m + 8)(5 + m - 8) = 0$$
$$(m + 13)(m - 3) = 0$$
$$m = -13,\ m = 3$$

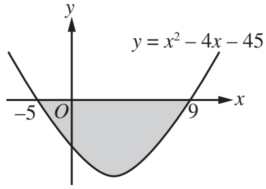
7 (a) $EN = QP - ME$
$$= (2x - 6) - (x - 1)$$
$$= 2x - 6 - x + 1$$
$$= x - 5$$

Luas bagi kawasan berlorek A
Area of shaded region A
$$= QP \times MQ - EN \times EF$$
$$= (2x - 6)(x + 2) - (x - 5) \times 6$$
$$= 2x^2 + 4x - 6x - 12 - 6x + 30$$
$$= 2x^2 - 8x + 18$$

(b) $A = 2x^2 - 8x + 18$
$$= 2(x^2 - 4x + 9)$$
$$= 2\left[x^2 - 4x + \left(-\frac{4}{2}\right)^2 - \left(-\frac{4}{2}\right)^2 + 9\right]$$
$$= 2[(x - 2)^2 + 5]$$
$$= 2(x - 2)^2 + 10$$
$\therefore a = 2, p = -2, q = 10$
$a = 2 > 0,$

Nilai bagi minimum A ialah 10 m^2.
The minimum value of A is 10 m^2.

(c) $2x^2 - 8x + 18 < 108$
$$2x^2 - 8x - 90 < 0$$
$$x^2 - 4x - 45 < 0$$
$$(x + 5)(x - 9) < 0$$



$\therefore 0 < x < 9$

(d)