

Part 2 - Exam-Type Questions.

$$1. \quad a) \quad \begin{aligned} \textcircled{1} \quad 3x + 4y &= -10 & \rightarrow \textcircled{1} \quad 3x + 4y + 10 &= 0 \\ \textcircled{2} \quad 5x - 2y &= 18 & \textcircled{2} \quad 5x - 2y - 18 &= 0 \quad (\times 2) \\ & & \rightarrow 10x - 4y - 36 &= 0 \end{aligned}$$

$$\text{If } x = 2$$

Sub in $\textcircled{1}$

$$3(2) + 4y = -10$$

$$6 + 4y = -10$$

$$4y = -10 - 6$$

$$4y = -16$$

$$y = -4$$

$$+ \quad \begin{array}{r} 3x + 4y + 10 = 0 \\ 10x - 4y - 36 = 0 \\ \hline 13x \quad -26 = 0 \end{array}$$

$$13x = 26$$

$$x = 2$$

\therefore solution is $x = 2, y = -4$

$$b) \quad \textcircled{1} \quad x = -2y + 3$$

$$\textcircled{2} \quad x = 3y - 7$$

$$x + 2y - 3 = 0$$

$$- \quad x - 3y + 7 = 0$$

$$\hline 5y - 10 = 0$$

$$5y = 10$$

$$\boxed{y = 2}$$

Sub in $y = 2$

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

$$= -4 + 3$$

$$\boxed{x = -1}$$

or substitute

$$\textcircled{1} \quad x = -2y + 3 \text{ in } \textcircled{2}$$

$$-2y + 3 = 3y - 7$$

$$-2y - 3y = -7 - 3$$

$$-5y = -10$$

$$\boxed{y = 2}$$

Sub in

$$x = 3(2) - 7$$

$$= 6 - 7$$

$$\boxed{x = -1}$$

(2)

$$1. c) \begin{cases} \textcircled{1} 2x - 3y - 1 = 0 \\ \textcircled{2} x - y - 1 = 0 \quad (\times 2) \\ \quad 2x - 2y - 2 = 0 \end{cases}$$

$$- \begin{array}{r} \textcircled{1} 2x - 3y - 1 = 0 \\ \textcircled{2} 2x - 2y - 2 = 0 \\ \hline -y + 1 = 0 \\ \boxed{y = 1} \end{array}$$

Sub $y=1$ in $\textcircled{1}$

$$2x - 3(1) - 1 = 0$$

$$2x - 3 - 1 = 0$$

$$2x = 4$$

$$\boxed{x = 2}$$

$$2. a) (2, 5) \quad (5, 13)$$

$$i) \text{ slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{13 - 5}{5 - 2} = \frac{8}{3}$$

$$ii) \text{ midpt} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left(\frac{2 + 5}{2}, \frac{5 + 13}{2} \right)$$

$$= \left(\frac{7}{2}, \frac{18}{2} \right)$$

$$= (3.5, 9)$$

$$iii) d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(5 - 2)^2 + (13 - 5)^2}$$

$$= \sqrt{3^2 + 8^2}$$

$$= \sqrt{9 + 64}$$

$$= \sqrt{73}$$

$$= 8.544$$

(3)

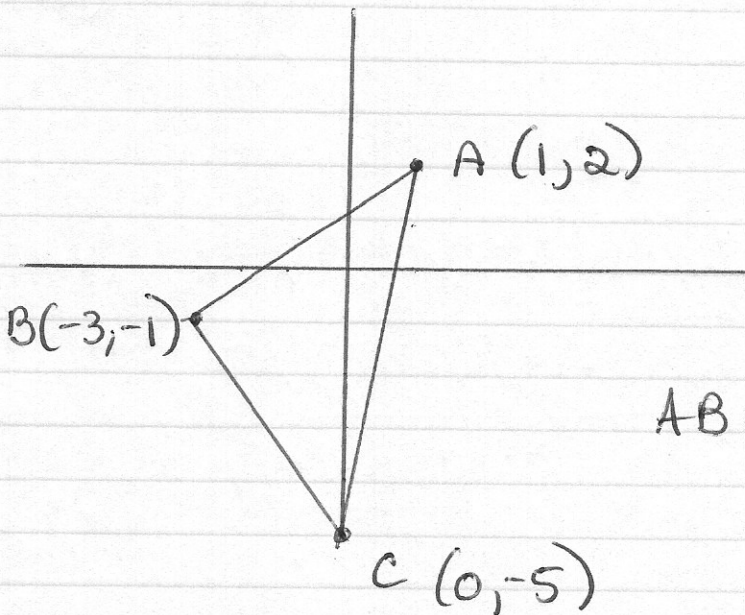
2 b) $(3, -5) + (-2, 5)$

i) slope = $\frac{5 - (-5)}{-2 - 3} = \frac{10}{-5} = -2$

ii) Midpt = $\left(\frac{3 + (-2)}{2}, \frac{-5 + 5}{2}\right) = \left(\frac{1}{2}, 0\right)$

iii) $d = \sqrt{(-2 - 3)^2 + (5 - (-5))^2}$
 $= \sqrt{(-5)^2 + (10)^2}$
 $= \sqrt{25 + 100}$
 $= \sqrt{125}$
 $= 11.18$

3.



Show that it is isosceles

(2 sides of equal lengths)

$AB = \sqrt{(-3 - 1)^2 + (-1 - 2)^2}$
 $= \sqrt{(-4)^2 + (-3)^2}$
 $= \sqrt{16 + 9} = \sqrt{25}$
 $= \boxed{5}$

$BC = \sqrt{(-3 - 0)^2 + (-1 - (-5))^2}$
 $= \sqrt{(-3)^2 + (4)^2}$
 $= \sqrt{9 + 16}$
 $= \sqrt{25} = \boxed{5}$

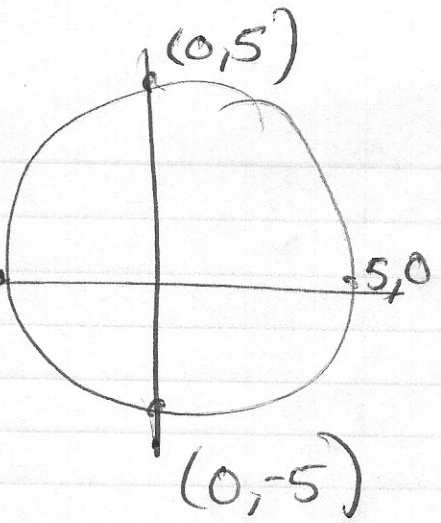
$AC = \sqrt{(1 - 0)^2 + (2 - (-5))^2}$
 $= \sqrt{(1)^2 + 7^2}$
 $= \sqrt{50} = \boxed{7.07}$

isosceles

5. a) $x^2 + y^2 = 25$

$r = \sqrt{25}$
 $= 5$

$(-5, 0)$



x-intercepts $(-5, 0)$ $(5, 0)$

y-intercepts $(0, 5)$ $(0, -5)$

6. $(0, 0)$ and $(4, -9)$ on circle
centre

$x^2 + y^2 = r^2$

Sub in point on circle

$4^2 + (-9)^2 = r^2$

$16 + 81 = r^2$

$97 = r^2$

∴ eqn of circle is

$x^2 + y^2 = 97$

7. Does point $(6, -3)$ lie inside, on or outside circle?

$x^2 + y^2 = 49$

Sub L.S. $= 6^2 + (-3)^2$ R.S. $= 49$

$= 36 + 9$

L.S. $= 45$

R.S. $= 49$

L.S. $<$ R.S.

∴ inside circle

5

$$\begin{aligned} 8. \ a) \quad & (3x+5)(2x-9) \\ & = (6x^2 - 27x + 10x - 45) \\ & = 6x^2 - 17x - 45 \end{aligned}$$

$$\begin{aligned} b) \quad & (3k+4)^2 = (3k+4)(3k+4) \\ & = 9k^2 + 12k + 12k + 16 \\ & = 9k^2 + 24k + 16 \end{aligned}$$

$$\begin{aligned} d) \quad & 3(2x+5)(x-3) + 2(x-4)^2 \\ & = 3(2x+5)(x-3) + 2(x-4)(x-4) \\ & = 3(2x^2 - 6x + 5x - 15) + 2(x^2 - 4x - 4x + 16) \\ & = 3(2x^2 - x - 15) + 2(x^2 - 8x + 16) \\ & = 6x^2 - 3x - 45 + 2x^2 - 16x + 32 \\ & = 8x^2 - 19x - 13 \end{aligned}$$

$$\begin{aligned} 9. \ a) \quad & x^2 + 2x - 15 \\ & = (x+5)(x-3) \end{aligned}$$

$$\begin{array}{r|l} -15 & \\ +5 & +2 \\ -3 & \end{array}$$

$$\begin{aligned} b) \quad & 3x^2 + 15x + 18 \\ & = 3(x^2 + 5x + 6) \\ & = 3(x+2)(x+3) \end{aligned}$$

$$\begin{array}{r|l} 6 & \\ 2 & 5 \\ 3 & \end{array}$$

$$\begin{aligned} c) \quad & 81 - 16p^2 \\ & = (\sqrt{81} - \sqrt{16p^2})(\sqrt{81} + \sqrt{16p^2}) \\ & = (9 - 4p)(9 + 4p) \end{aligned}$$

6

$$\begin{aligned}
 \text{9d) } & 9x^2 - 12x + 4 \\
 & = (3x-2)(3x-2) \\
 & = (3x-2)^2
 \end{aligned}$$

$$\begin{array}{r|l}
 9 & 4 \\
 \hline
 3 & -2 \\
 3 & -2 \\
 \hline
 & -12 \\
 & -6 + -6 = -12
 \end{array}$$

$$\begin{aligned}
 \text{e) } & 12x^2 - 5x - 2 \\
 & = (4x+1)(3x-2)
 \end{aligned}$$

$$\begin{array}{r|l}
 12 & -2 \\
 \hline
 4 & 1 \\
 3 & -2 \\
 \hline
 & -5 \\
 & -8 + 3 = -5
 \end{array}$$

$$\begin{aligned}
 \text{11. a) } & x^2 + 6x - 72 = 0 \\
 & (x+12)(x-6) = 0
 \end{aligned}$$

$$\therefore x+12=0 \text{ or } x-6=0$$

$$\boxed{x=-12} \text{ or } \boxed{x=6}$$

$$\begin{array}{r|l}
 -72 & \\
 \hline
 12 & +6 \\
 -6 & \\
 \hline
 &
 \end{array}$$

$$\text{c) } x^2 - 4x - 1 = 0$$

use quadratic

$$a=1 \quad b=-4 \quad c=-1$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$X = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-1)}}{2(1)}$$

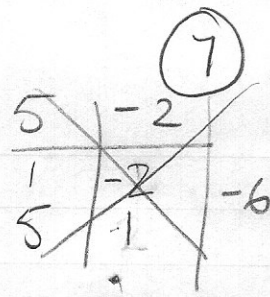
$$= \frac{4 \pm \sqrt{16+4}}{2}$$

$$= \frac{4 \pm \sqrt{20}}{2}$$

$$X = \frac{4+4.47}{2} \text{ or } X = \frac{4-4.47}{2}$$

$$X = 8.87/2 = \boxed{4.24} \text{ or } X = \boxed{-0.235}$$

11. d) $5x^2 - 6x - 2 = 0$
 use quadratic



$a=5 \quad b=-6 \quad c=-2$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(5)(-2)}}{2(5)}$$

$$= \frac{6 \pm \sqrt{36 + 40}}{10}$$

$$= \frac{6 \pm \sqrt{76}}{10} = \frac{6 \pm 8.72}{10}$$

$$x = \frac{6 + 8.72}{10}$$

or $x = \frac{6 - 8.72}{10}$

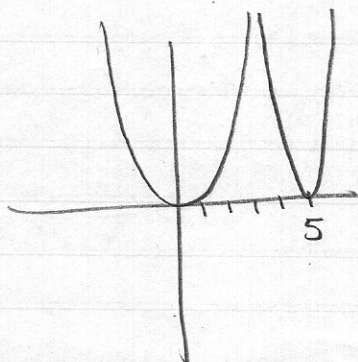
$$x = \frac{14.72}{10}$$

$$x = -0.272$$

$$x = 1.472$$

12. a) $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



a) $y = 2(x-5)^2$
 stretch by 2
 opens up
 shift right by 5

x	y
0	50
5	0
10	50

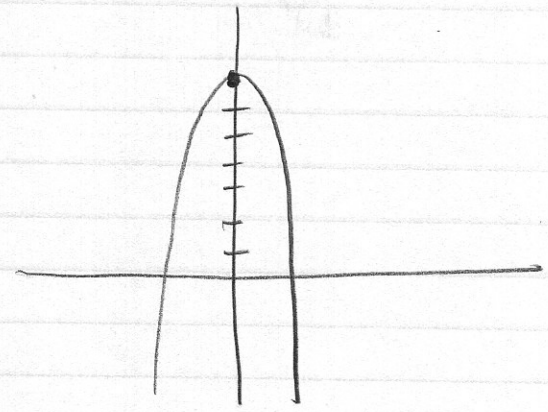
12b.

$$y = -x^2 + 7$$

↑
opens
down
-no stretch

↑ shifts up by 7

no horizontal shift

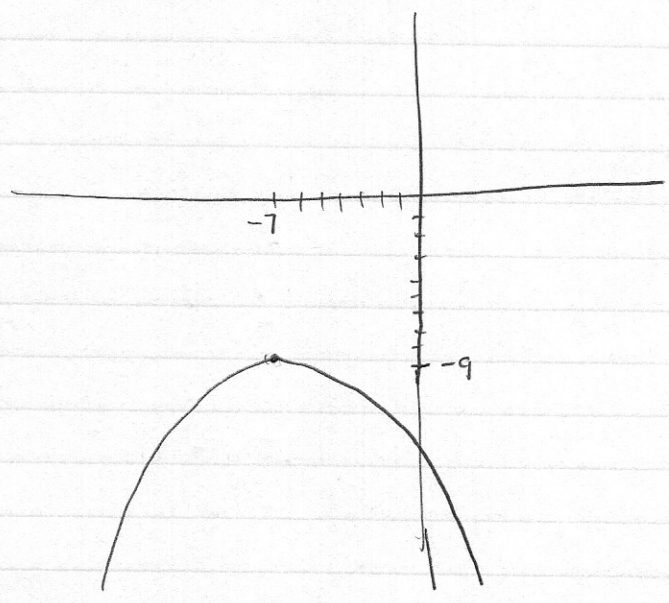


c) $y = -0.5(x+7)^2 - 9$

↑
opens down
compression by $\frac{1}{2}$

↑ left +7

down 9



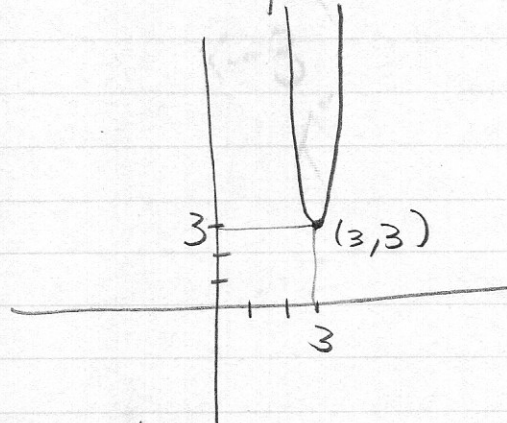
(9)

12 d)

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

↑ opens up ↑ right 3 ↖ up 3

stretch by 5

13. a) zeros $\Rightarrow -3, 7$ max. 4

$$x \text{ midpoint } \frac{-3+7}{2} = 2$$

 \therefore vertex $(2, 4)$

$$y = a(x-2)^2 + 4$$

Sub $(-3, 0)$ in eqn

$$0 = a(-3-2)^2 + 4$$

$$0 = a(-5)^2 + 4$$

$$0 = 25a + 4$$

$$\frac{-4}{25} = \frac{25a}{25}$$

$$a = \frac{-4}{25}$$

$$\therefore y = -\frac{4}{25}(x-2)^2 + 4$$

13 b) zeros -6 + 2 y-intercept -9

→ (0, -9)

axis of symmetry = x midpoint $\frac{-6+2}{2} = \frac{-4}{2} = -2$

Using zeros

→ $y = a(x+6)(x-2)$

Sub in (0, -9)

$-9 = a(0+6)(0-2)$

$-9 = a(6)(-2)$

$-9 = a(-12)$

$\frac{-9}{-12} = \frac{a}{-12}$

$a = \frac{3}{4}$

∴ $y = \frac{3}{4}(x+6)(x-2)$

c) vertex (3, 7) + pt (-1, -17)

$y = a(x-3)^2 + 7$

$-17 = a(-1-3)^2 + 7$

$-17 = 16a + 7$

$-17 - 7 = 16a$

$\frac{-24}{16} = a$

$a = -\frac{3}{2}$

$y = -\frac{3}{2}(x-3)^2 + 7$

d) vertex (-4, -2)

y-int -8 ⇒ (0, -8)

$y = a(x+4)^2 - 2$

$-8 = a(0+4)^2 - 2$

$-8 = 16a - 2$

$-8 + 2 = 16a$

$\frac{-6}{16} = a$

$a = -\frac{3}{8}$ ∴ $y = -\frac{3}{8}(x+4)^2 - 2$

14. a) $y = 2(x-3)(x+7)$

Zeros $x=3$ $x=-7$

Midpt $\frac{3+(-7)}{2} = \frac{-4}{2} = -2$

If $x = -2$

$y = 2(-2-3)(-2+7)$
 $= 2(-5)(5)$
 $= -50$

Vertex $(-2, -50)$

$y = 2(x+2)^2 - 50$

b)

$y = x^2 - 6x - 4$
 $= (x^2 - 6x) - 4$
 $= (x^2 - 6x + 9 - 9) - 4$
 $= (x^2 - 6x + 9) - 9 - 4$
 $y = (x-3)^2 - 13$

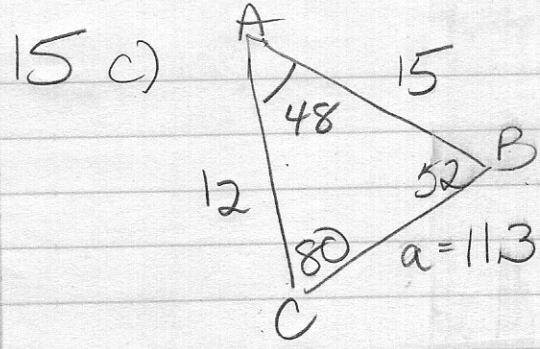
Complete the square

c)

$y = 2x^2 - 4x + 7$
 $y = 2(x^2 - 2x) + 7$
 $= 2(x^2 - 2x + 1 - 1) + 7$
 $= 2(x-1)^2 - 2 + 7$
 $= 2(x-1)^2 + 5$

d)

$y = 5x^2 + 20x - 11$
 $= 5(x^2 + 4x) - 11$
 $= 5(x^2 + 4x + 4 - 4) - 11$
 $= 5(x^2 + 4x + 4) - 20 - 11$
 $= 5(x+2)^2 - 31$



$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$= (12^2 + 15^2) - (2(12)(15) \cos 48)$$

$$= (369) - (241)$$

$$a^2 = 128$$

$$a = \sqrt{128}$$

$$= 11.3$$

$$\frac{\sin 48}{11.3} = \frac{\sin B}{12}$$

$$\frac{\sin 48}{11.3} = \frac{\sin C}{15}$$

$$\frac{\sin 48(12)}{11.3} = \sin B$$

$$\frac{\sin 48(15)}{11.3} = \sin C$$

$$0.7892 = \sin B$$

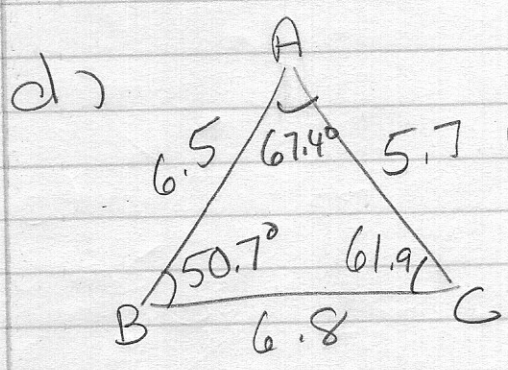
$$\angle B = \sin^{-1} 0.7892$$

$$= \underline{\underline{52^\circ}}$$

$$0.9865 = \sin C$$

$$\angle C = \sin^{-1} 0.9865$$

$$= \underline{\underline{80^\circ}}$$



①

$$\cos A = \frac{a^2 - b^2 - c^2}{-2bc}$$

$$= \frac{6.8^2 - 5.7^2 - 6.5^2}{-2(5.7)(6.5)}$$

$$= \frac{-28.5}{-74.1}$$

②

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 67.4}{6.8} = \frac{\sin B}{5.7}$$

$$\sin B = \frac{\sin 67.4(5.7)}{6.8}$$

$$= 0.77387$$

$$\angle B = \sin^{-1} 0.77387$$

$$= 50.7^\circ$$

$$\cos A = 0.384615$$

$$\angle A = \cos^{-1} 0.384615$$

$$\angle A = 67.4^\circ$$

③

$$\angle C = 180 - 50.7 - 67.4$$

$$\angle C = 61.9$$