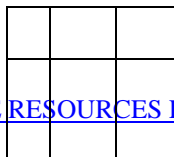
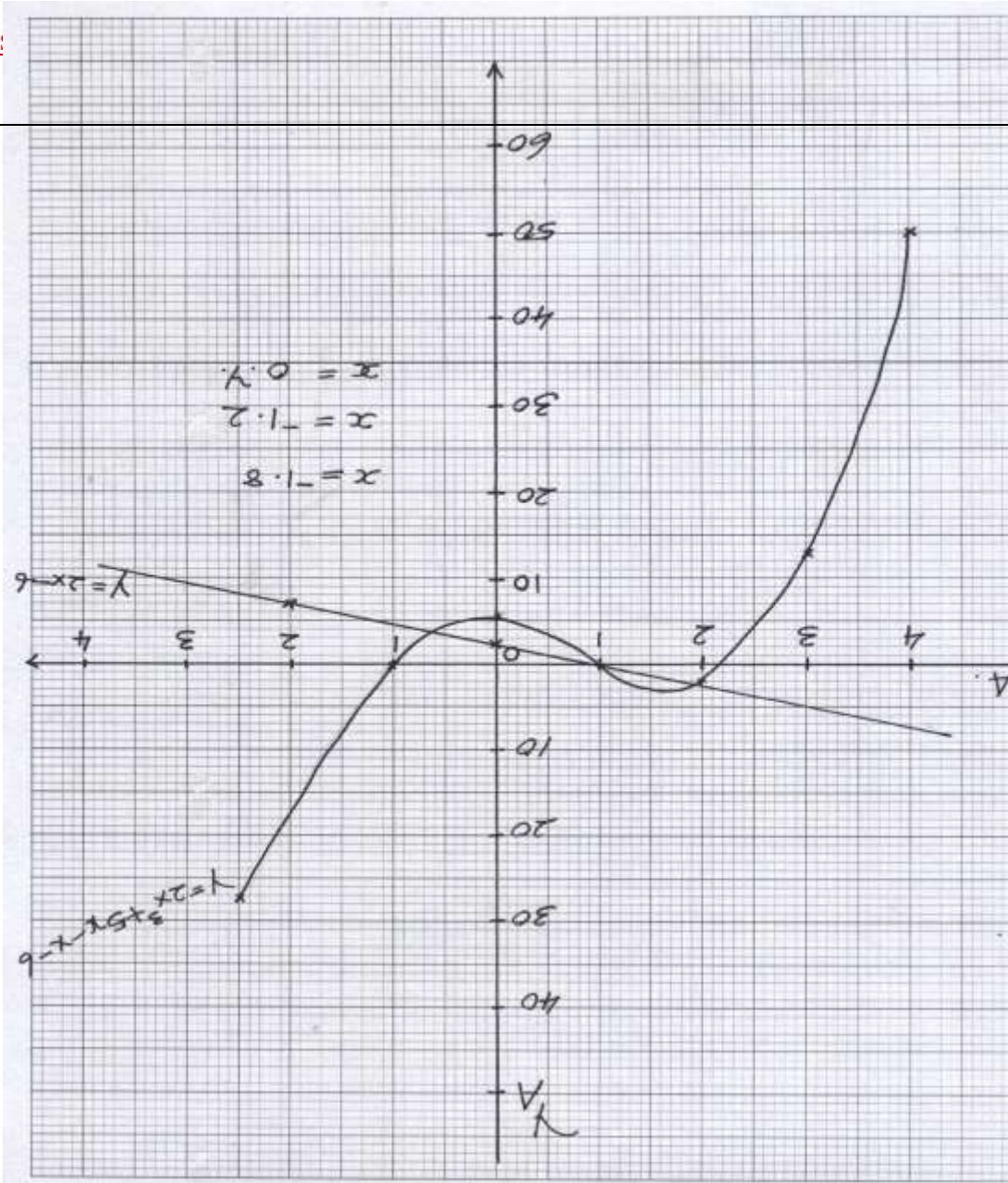


2. Quadratic expressions and equation 2

1								B₂		
	x	-4	-3	-2	-1	0	1			2
	$2x^3$	-128	-54	-16	-2	0	2			16
	$5x^2$	80	45	20	5	0	5			20
	-x	4	3	2	1	0	-1			-2
	-6	-6	-6	-6	-6	-6	-6			-6
	y	-50	-12	0	-2	-6	0			28
$2x^3 + 5x^2 + x - 6 = y$ $2x^3 + 5x^2x - 4 = 0$ $-2x - 2 = y$ $y = -2x - 2$										
X	0	2								
Y	-2	-6								



<p>2</p>	<p>a)</p> $\frac{dy}{dx} = 4x - 6$ <p>b)</p> $4x - 6 = 0 \therefore x = 1.5$ $y = 2(1.5)^2 - 6(1.5) + 9$ $= 4.5$ <p>\therefore Turning point (1.5,4.5)</p> $\begin{array}{r} 1 \quad 1.5 \quad 2 \\ - \quad 0 \quad +2 \\ 1 \end{array}$	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p>	<p>Equating to zero</p>
-----------------	---	---	-------------------------

	\ - /		
	<p>Minimum point</p> <p>d) (i)</p> <p>Gradient = 2</p> $\frac{y-5}{x-2} = 2$ $\therefore y = 2x + 1$ <p>(ii)</p> $M_1 \times M_2 = -1$ $\therefore M_2 = -\frac{1}{2}$ $\frac{y-5}{x-2} = -\frac{1}{2}$ $\therefore y = -\frac{1}{2}x + 6$	B1 B1 B1	✓ gradient ✓ gradient of normal
		10	
3.	$A = \frac{1}{2} \times \{(6+14) + 2(6 + 4 \ 16)\}$ $= \frac{1}{2} (20 + 32)$ $= 26$ units	M1 M1 A1	Use of absolute values of y
		03	

1.

(a)

x	-2	-1	0	1	2	3	4	5	6
y	-17	-9	-3	1	3	3	1	-3	-9

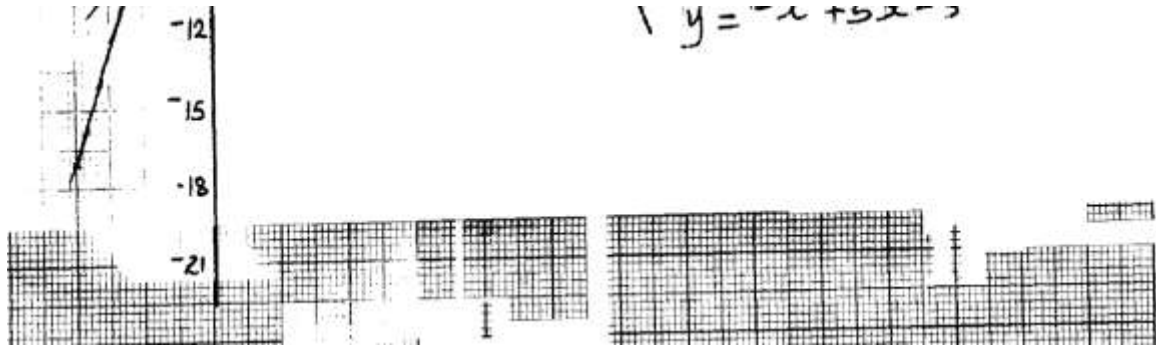
(b) $y = 5x - x^2 - 3$
 $0 = 5x - x^2 - 3$
 $y = 0$
 $x = 0.75 \text{ or } 4.3 \pm 0.1$

(c) $y = 5x - x^2 - 3$
 $0 = 2x - x^2 + 3$
 $y = 3x - 6$

*For all $\sqrt{\quad}$ values of y B1
 for at least 5 $\sqrt{\quad}$ values.*

x	0	-1	2
y	-6	-9	0

$x = -1 \text{ or } 3 \pm 0.1$



2. $x - 2.5 - \sqrt{3} \quad x - 2.5 + \sqrt{3} = 0$
 $x^2 - 2.5x + \sqrt{3}x - 2.5x + 6.25 - 2.5$
 $\sqrt{3}x\sqrt{3} + 2.5\sqrt{3} = 0$
 $x^2 - 5x + 6.25 - 3 = 0$
 $x^2 - 5x + 3.25 = 0$
 $4x^2 - 20x + 13 = 0$

3. $17.35 \times 13.85 = 240.3$
 $17.35 \times 13.75 = 237.2$
 $\therefore 17.3 \times 13.8 = 238.7$
Max err $240.3 - 238.7 = 1.5$
Min err $238.7 - 237.2 = 1.6$
Max err $= \frac{1.6 + 1.5}{2} = \frac{3.1}{2} = 1.55$

Product 238.7 ± 1.55
Last product 240
Max err $= 1.55$

Relative err $= \frac{1.55}{28.1\%}$
error $= \frac{1.55}{28.1} \times 100 = 0.6\%$
Relative err $= \frac{1.55}{28.1}$

238.7

4.

x	-6	-5	-4	-3	-2	-1	0	1	2	3	4
-----	----	----	----	----	----	----	---	---	---	---	---

y		04	-2		-8	-8		-2	4	12	
---	--	----	----	--	----	----	--	----	---	----	--

(c) (i) $x^2 + 3x - 6 = 0$

$$x = -4.5 \text{ or } 1.5 \pm 0.2$$

(ii) $y = x^2 + 3x - 6$

$$x^2 + 3x - 2$$

$$y = -4$$

$$x = 5 \text{ or } 4 \pm 0.2$$

5.

x	-4	-3	-2	-1	0	1	2	3
y	21	10	3	0	1	6	15	28

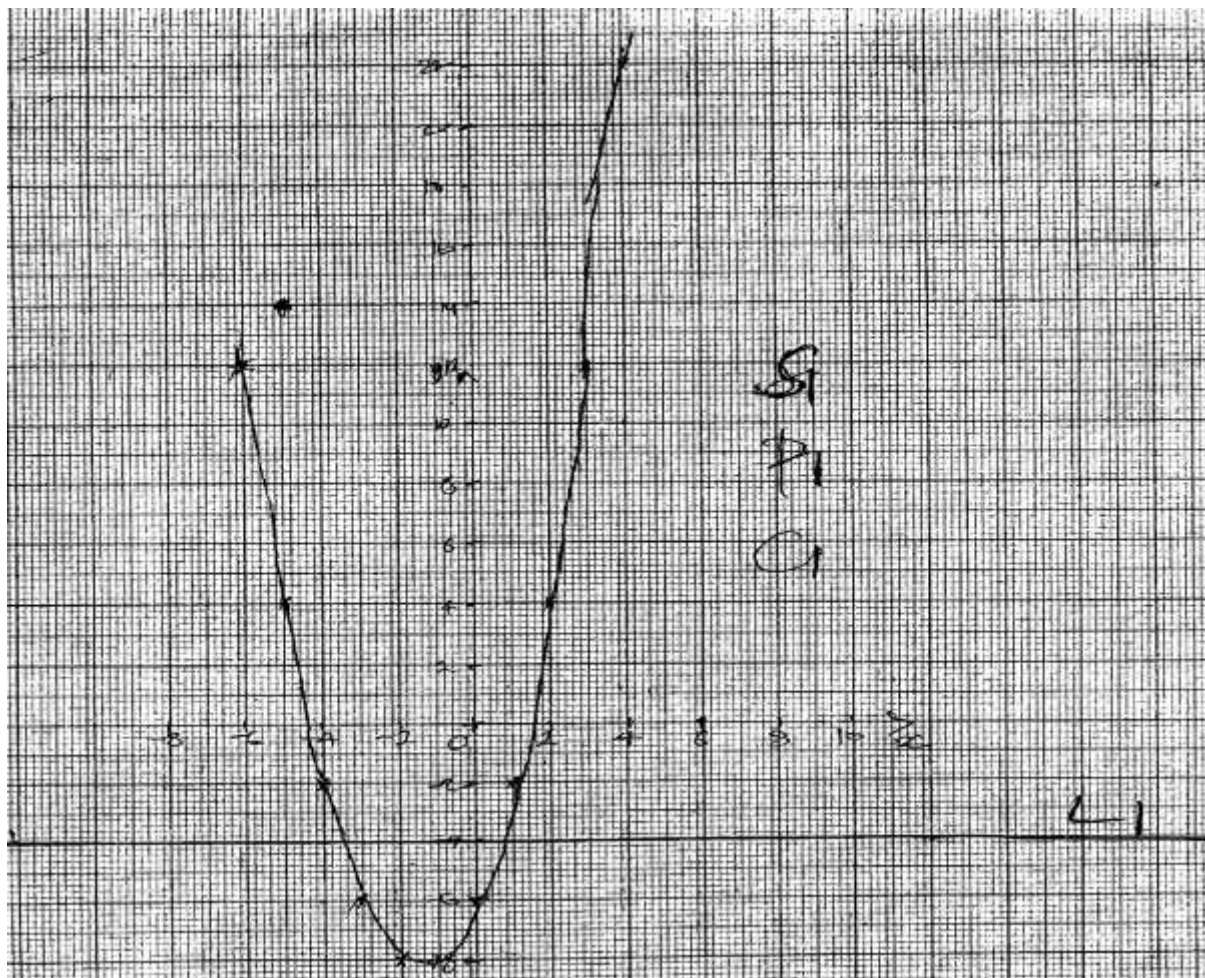
(c) $2x^2 + 3x + 1 = 0$

$$\underline{2x + 4x - 3 = 0}$$

$$-x + 2 = y$$

$$x = 0.6 \text{ or } x = -2.6 \pm 0.1$$

(d) $x = 0.30 - x = -1.8 \pm 0.1$



6. a) i) $\frac{480,000}{x} =$
 ii) $\left(\frac{x}{480,000}\right) =$

$$b) \quad \frac{480,000}{x-4} = \frac{480,000}{x} + 20,000$$

Multiply all hr' by L.C.M.

$$480,000x = 480,000(x-4) + 20,000(x^2 - 4x)$$

Dividing by 10,000

$$48x = 48x - 192 + 2x^2 - 4x$$

$$48x - 48x + 4x - 2x^2 + 192 = 0$$

$$4x - 2x^2 + 192 = 0$$

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

$$= \frac{-4 \pm \sqrt{1552}}{-4}$$

$$= \frac{-4 \pm 39.3954}{4}$$

$$x = \frac{-4 + 39.3954}{-4} \quad \text{or} \quad x = \frac{-4 - 39.3954}{-4}$$

But x cannot be -ve hence

$$x = \frac{-43.3954}{-4} = 10.8489$$

$$= 11$$

c) Original : new cont.

$$\frac{480,000}{11} : \frac{480,000}{7}$$

d) Size of land bought = 6 hectares

$$\frac{6}{7} = 0.857143$$

$$\frac{6}{7} \approx 0.8571 \text{ hectares}$$

7.

x	-3	-2	-1	0	1	2
y	13	4	-1	-2	1	8

19.

$$(iii) \quad y = 2x^2 + x - 2$$

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

$$y = -x + 1$$

x	-3	-2	-1	0	1	2
y	5	3	2	1	0	-1

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

$$0 = 2x^2 + x - 5$$

$$y = -x + 3$$

8. (a) Dist. traveled in 3hrs s. drawing

$$\text{Plane A} - 400 \times 3 = 1200\text{km} - \text{cm}$$

Plane B – $500 \times 3 = 7.5\text{cm}$

Plane C – $300 \times 3 = 900\text{km} = 4.5\text{cm}$

(b) Dist. BA = $12.8 \times 200 = 2560\text{km} = 20\text{km}$

$$T = \frac{D}{S} = \frac{2560}{500} \text{ hrs}$$

$$= 5.12 \text{ hrs of } 5 \text{ hrs, } 7.2 \text{ mns}$$

$$\approx 5 \text{ hrs, } 7 \text{ min (nearest min)}$$

(c) Bearing of B from C = $360^\circ - 20^\circ = 340^\circ$
 Dist. BC = $(10.9 \pm 0.1 \times 200) \text{ km}$
 $= 2180 \text{ km} \pm 20 \text{ km}$

9. a)

x	-2	-1.5	-1	-0.5	0	0.5	1
x^2	4	2.25	1	0.25	0	0.25	1
$4x$	-8	-6	4	-2	0	2	4

4	4	4	4	4	4	4	4
y	0	0.25	9	2.25	4	6.25	9

$$A = \frac{1}{2} h \left\{ (y_1 + y_7) + 2(y_2 + \dots + y_6) \right\}$$

$$= \frac{1}{2} \times \frac{1}{2} \left\{ (0 + 9) + 2(0.25 + 9 + 2.25 + 4 + 0.25) \right\} \sqrt$$

$$= \frac{1}{4} \left\{ 9 + 4.25 \right\} \sqrt$$

$$= 13.25 \text{ sq. units } \sqrt$$

b) $\int_2^0 (x^2 + 4x + 4) dx + \int_0^1 (x^2 + 4x + u) dx$

$$\left[\frac{x^3}{3} + 2x^2 + 4x \right]_2^0 + \left[\frac{x^3}{3} + 2x^2 + ux \right]_0^1 \sqrt$$

$$= \left(-\frac{8}{3} + 8 - 8 \right) + \left(\frac{1}{3} + 2 + 4 \right) \sqrt$$

$$= \frac{9}{3} \sqrt$$

Error = $13.25 - 9 = 4.125$

$$\% = \frac{4.125}{9} \sqrt \times 100$$

$$= 45.84\%$$

10. a)

x	-2	-1.5	-1	-0.5	0	0.5	1
x^2	4	2.25	1	0.25	0	0.25	1
$4x$	-8	-6	4	-2	0	2	4

4	4	4	4	4	4	4	4
-----	-----	-----	-----	-----	-----	-----	-----

$$\begin{aligned} y & \quad 0 \quad 0.25 \quad 9 \quad 2.25 \quad 4 \quad 6.25 \quad 9 \\ A &= \frac{1}{2} h \left\{ (y_1 + y_7) + 2(y_2 + \dots + y_6) \right\} \\ &= \frac{1}{2} \times \frac{1}{2} \left\{ (0 + 9) + 2(0.25 + 9 + 2.25 + 4 + 0.25) \right\} \quad \checkmark \\ & \quad \left\{ \quad \quad \right\} \end{aligned}$$

$$= \frac{1}{4} \sqrt{9 + 4.25}$$

$$= \underline{13.25 \text{ sq. units}}$$

$$b) \int_2^0 (x^2 + 4x + 4) dx + \int_0^1 (x^2 + 4x + u) dx$$

$$\left[\frac{x^3}{3} + 2x^2 + 4x \right]_2^0 + \left[\frac{x^3}{3} + 2x^2 + ux \right]_0^1 \sqrt{}$$

$$= \left(-\frac{8}{3} + 8 - 8 \right) + \left(\frac{1}{3} + 2 + 4 \right) \sqrt{}$$

$$= \underline{9} \sqrt{}$$

$$\text{Error} = 13.25 - 9 = 4.125$$

$$\% = \frac{4.125}{9} \sqrt{ } \times 100$$

$$= \underline{45.84\%}$$

11. $y = 2x^2 - 4x - 5$ $y = 2x + 3$

X	-3	-2	0	1	2	3	4	5			x	-4	-2	0	2
$2x^2$	18	2	0	2	8	18	32	50			y	-5	-1	3	7
4x	-12	-8	-4	0	4	8	12	16	20						
5	5	5	5	5	5	5	5	5	5						
y	25	11	1	-5	-7	1	11	25	11	B_2					

- (a) $x = 1$
- (b) -0.9×2.8
 $x = -1 \text{ and } x = 4$

12.

X	-	-1	0	1.5	2	2.5	3.5
Y	-4	0	5	5	3	0	-9

- (0.75, 6.125)
- Y = -2
- Range of values $-1.3 < x < 2.75$
- Integral values; -1, 0, 1, 2

13. a)

x	-4	-3	-2	-1	0	1	2
$2x^2$	32	18	8	2	0	2	8
$4x - 3$	-19	-15	-11	-7	-3	1	5
y	13	3	-3	-5	-3	3	13

- (b) Roots for $x = -2.6 \pm 0.1$
 $x = 0.6 \pm 0.1$

$$y = 2x^2 + 4x - 3$$

$$\frac{0 = 2x^2 + x - 5}{y = 3x + 2}$$

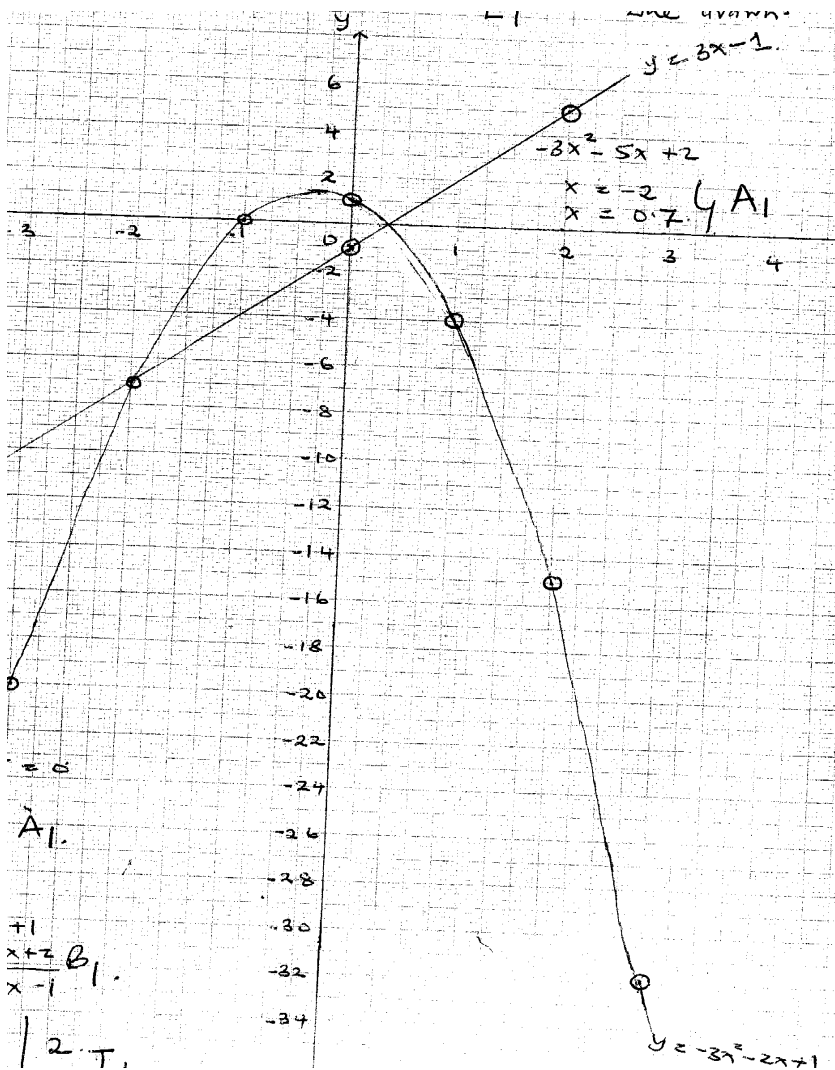
Roots read from the 2 pts of intersection of the line and curve.

$$X = -1.9 \pm 0.1$$

$$X = 1.4 \pm 0.1$$

14.

x	-3	-2	-1	0	1	2	3
$-3x^2$	-27	-12*	-3	0	-3*	-12	-27*
$-2x$	6*	4	2*	0	-2*	-4*	-6
1	1	1	1	1	1	1	1
y	-20	-7*	0*	1	-4*	-15	-32*



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

$$x = -1$$

$$\text{or } x = 0.7 \quad A_1$$

$$\begin{array}{l} y = -3x^2 - 2x + 1 \\ \underline{0 = -3x^2 - 5x + 2} \\ y = 0 + 3x - 1 \end{array} \quad B_1$$

T_1

15. $x^2 + ax - b = 0$
 $(x-1)(x+5) = x^2 + ax - b$
 $x^2 + 4x - 5 = x^2 + ax - b$
 $a = 4, b = 5$

16. Let $a = 1.5 + \sqrt{2}$
 $b = 1.5 - \sqrt{2}$
 $\therefore (x-a)(x-b) = 0$
 $x^2 - xb - ax + ab = 0$
 $x^2 - x(1.5 - \sqrt{2}) - x(1.5 + \sqrt{2}) + ab = 0$
 $x^2 - 1.5x + x\sqrt{2} - x1.5x - \sqrt{2} = 0$
 $x^2 - 3x + ab$
 $x^2 - 3x + (1.5 + \sqrt{2})(1.5 - \sqrt{2}) = 0$
 $x^2 - 3x + 2.25 - 2 = 0$
 $x^2 - 3x + \frac{1}{4} = 0$

17. a) i) $a^2 + b^2 = 89$ $a + b = 13$
 $a^2 + 2ab + b^2 = (a + b)^2 = 13^2 = 169$

ii) $2ab = 169 - 89$
 $= 80$

iii) $a^2 - 2ab + b^2 = a^2 + b^2 - 2ab$
 $= 89 - 80 = 9$

iv) $(a - b)^2 = 9$
 $a - b = \pm 3$

b) $a + b = 13$
 $\frac{a - b = 3}{2a = 16}$