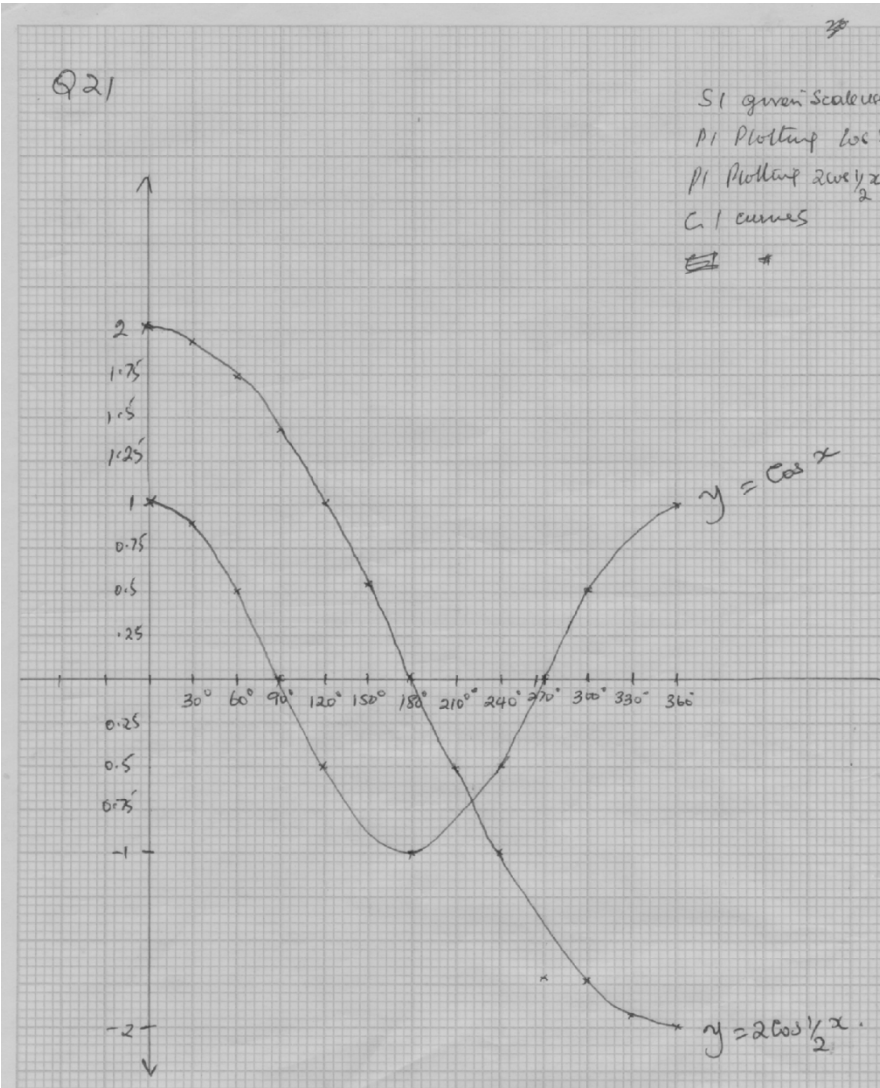


2. Trigonometric ratios 3

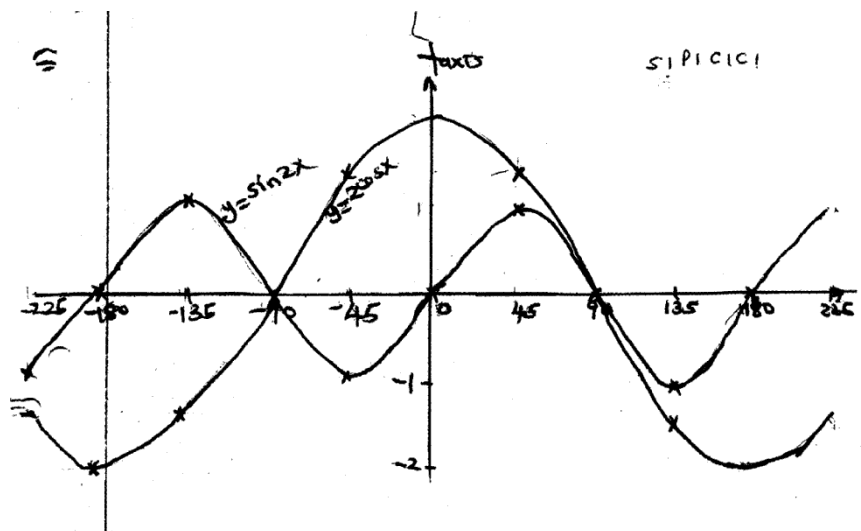
1.	<table><tr><td>X⁰</td><td>0⁰</td><td>30⁰</td><td>60⁰</td><td>90⁰</td><td>120⁰</td><td>150⁰</td><td>180⁰</td><td>210⁰</td><td>240⁰</td><td>270⁰</td><td>300⁰</td><td>330⁰</td></tr><tr><td>Cos x</td><td>1.00</td><td>0.87</td><td>0.50</td><td>0</td><td>-0.5</td><td>-0.87</td><td>-1</td><td>-0.87</td><td>-0.5</td><td>0.5</td><td>0.7</td><td>1</td></tr><tr><td>2cos ½ x</td><td>2.00</td><td>1.93</td><td>1.73</td><td>1.41</td><td>1</td><td>0.52</td><td>0.00</td><td>-0.52</td><td>-1</td><td>-1.73</td><td>-1.93</td><td>-2.00</td></tr></table>													X ⁰	0 ⁰	30 ⁰	60 ⁰	90 ⁰	120 ⁰	150 ⁰	180 ⁰	210 ⁰	240 ⁰	270 ⁰	300 ⁰	330 ⁰	Cos x	1.00	0.87	0.50	0	-0.5	-0.87	-1	-0.87	-0.5	0.5	0.7	1	2cos ½ x	2.00	1.93	1.73	1.41	1	0.52	0.00	-0.52	-1	-1.73	-1.93	-2.00																																																																
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	Q21  (a) amplitude = 2 B1 period = 720⁰ B1 (b) 2cos ½ x = cos x X = 222⁰ ±6⁰																																																																																																																			
	<table><tr><td>B1</td><td colspan="12">All values of cos x</td></tr><tr><td>B1</td><td colspan="12">All values of cos ½ x</td></tr><tr><td>S1</td><td colspan="12">Given scale used</td></tr><tr><td>P1</td><td colspan="12">Plotting cos x</td></tr><tr><td>P1</td><td colspan="12">Plotting 2 cos ½ x</td></tr><tr><td>C1</td><td colspan="12">Curve smooth continuous</td></tr><tr><td>B1</td><td colspan="12"></td></tr><tr><td>B1</td><td colspan="12"></td></tr></table>												B1	All values of cos x												B1	All values of cos ½ x												S1	Given scale used												P1	Plotting cos x												P1	Plotting 2 cos ½ x												C1	Curve smooth continuous												B1													B1												
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1. a)

X°	-225	-180	-135	-90	-45	0	45	90	135	180	225
$y = \sin 2x$		0		0	1.0		1.0	0		0	

$y = 2\cos x$		-2.0		0	1.4		1.4	0		-2.0	
---------------	--	------	--	---	-----	--	-----	---	--	------	--

b)



(c) -90° or 90°

(d) (i) Highest point 1 unit
Lowest point -1.4

2.

x	0	30	60	90	120	150	180	210
$2\sin(x+15^\circ)$	0.52	1.41	1.93	1.93	1.41	0.52	-0.52	-1.4
$\cos(2x-30^\circ)$	0.87	0.87	0	-0.87	0.87	0	0.87	0.87

x	240	270	300	330	360
$2\sin(x+15^\circ)$	-1.93	-1.93	-1.41	-0.52	0.52
$\cos(2x-30^\circ)$	0	-0.87	-0.87	0	0.87

B_1

B_1

B_1

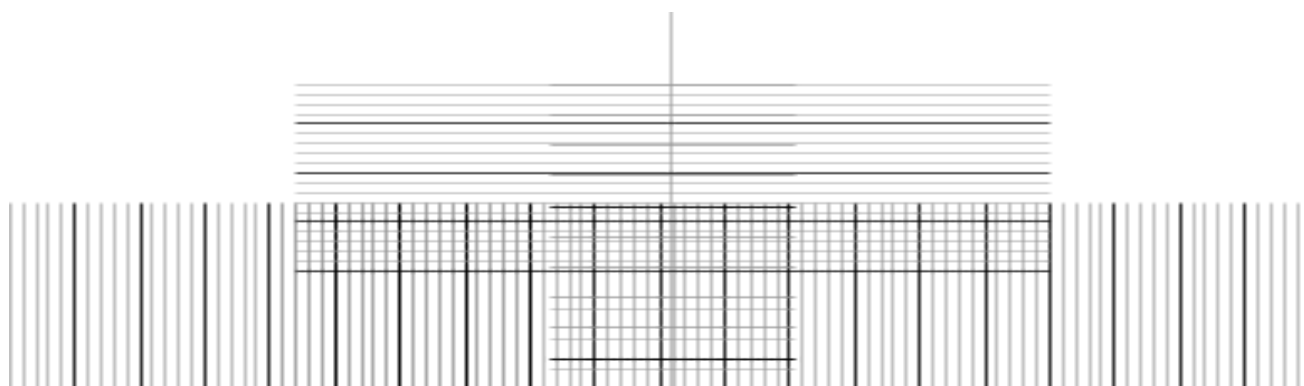
(i) Amplitudes: $y = 2\sin(x+15)$
= 2 units

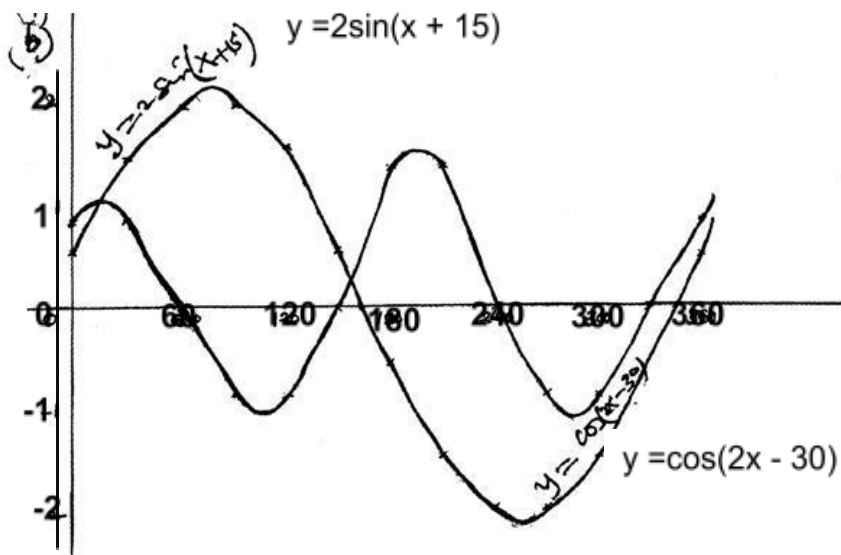
$y = \cos(2x-30)$
= 1 unit

B_1

B_1

$12^\circ, 159^\circ$





S₁

P₁

C₁

C₁

3. Determine the

i) Altitude of the frustrum

Solution

$$A'C' = \sqrt{4^2 + 4^2} = \sqrt{32}$$

$$AC = \sqrt{10^2 + 10^2}$$

$$= \sqrt{200}$$

$$= 10\sqrt{2}$$

$$AM + XM = 10\sqrt{2} - 4\sqrt{2}$$

$$= 6\sqrt{2}$$

$$AM = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$$

$$\text{Height} = AM = \sqrt{5^2 - (3\sqrt{2})^2} = \sqrt{25 - 18}$$

$$= \sqrt{7} = 2.646$$

$\therefore$ the altitude of the frustrum = 2.646 cm



ii) Angle between AC and the base

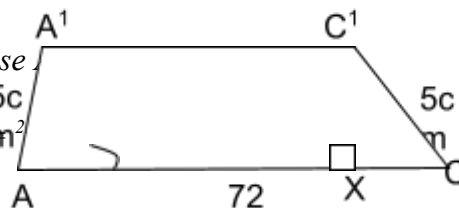
$$AX = 3\sqrt{2} + 4\sqrt{2} = 7\sqrt{2}$$

$$\tan \theta = \frac{CX}{AX} = \frac{\sqrt{7}}{7\sqrt{2}}$$

$$= 0.2673$$

$$\theta = \tan^{-1} 0.2673$$

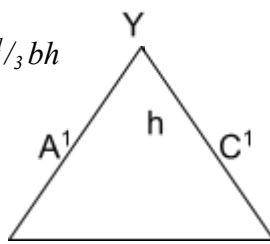
$$= 14.96^\circ$$



iii) Volume of pyramid = $\frac{1}{3}bh$

$$AC = 10\sqrt{2}$$

$$A'C' = 4\sqrt{2}$$



$$L.S.F = 10:4$$

$$\therefore \frac{h + 2.646}{h} = \frac{10}{4}$$

$$4(h + 2.646) = 10h$$

$$4h + 10.584 = 10h$$

$$6h = 10.584$$

$$h = 1.764$$

$$H = h + 2.646$$

$$= 1.764 + 2.646 = 4.410$$

$$\begin{aligned} Vf &= \left(\frac{1}{3} \times 10 \times 10 \times 4.41\right) - \left(\frac{1}{3} \times 4 \times 4 \times 1.76\right) \\ &= \frac{441.0}{3} - \frac{28.224}{3} \\ &= \frac{413.776}{3} \\ &= 137.592 \text{ cm}^3 \end{aligned}$$

4. (a) table completed

(b)

(c) (i) 3 PI - plotting

SI - scale

CI - smooth curve

(ii) 180°

(iii) Line $y = 1$ drawn

$$x = 4.5^\circ \text{ or } 72.8^\circ - 107.2^\circ - 175.4^\circ$$

5. $\left(\frac{A}{B}\right)^2 = \frac{p + 33q}{q - 3P}$

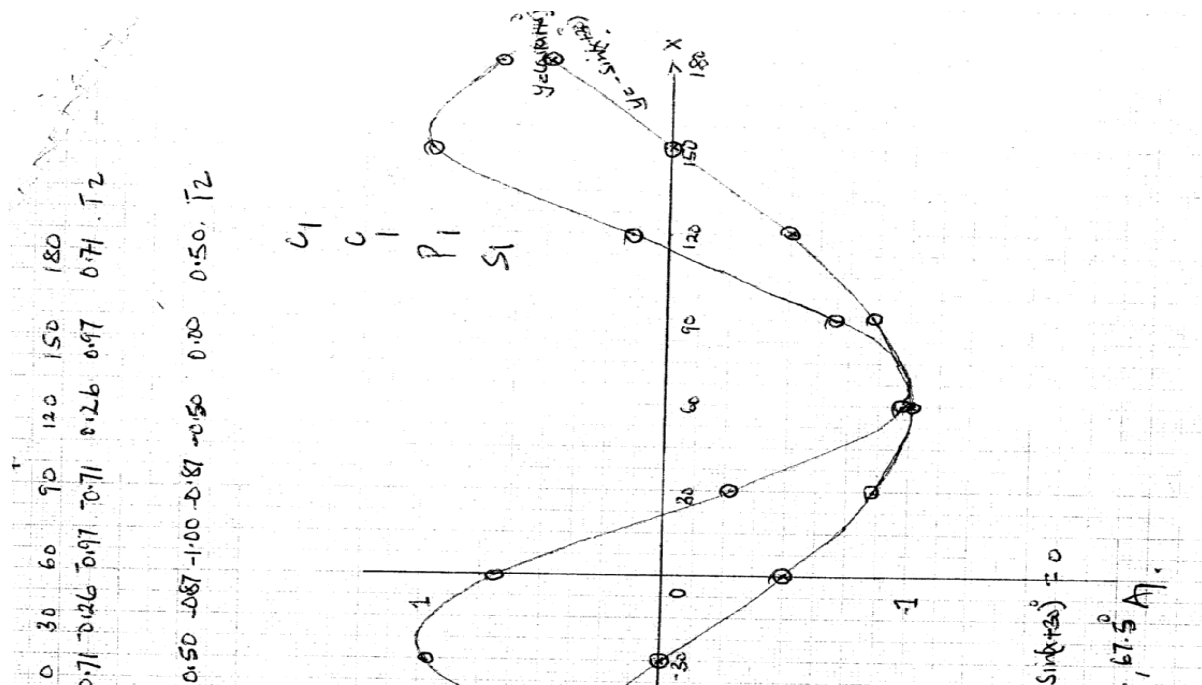
$$A^2q - 3A^2P = BP + 3Bq$$

$$Aq^2 - 3Bq = BP + 3A^2P$$

$$2(A^2 - 3B) = BP + 3A^2P$$

$$Q = \frac{BP + 3A^2P}{A^2 - 3B}$$

6.



$$7.7. \frac{\sqrt{3}}{2} \times \frac{1}{2}$$

$$\frac{1}{\sqrt{3}} \times \frac{1}{\sqrt{2}}$$

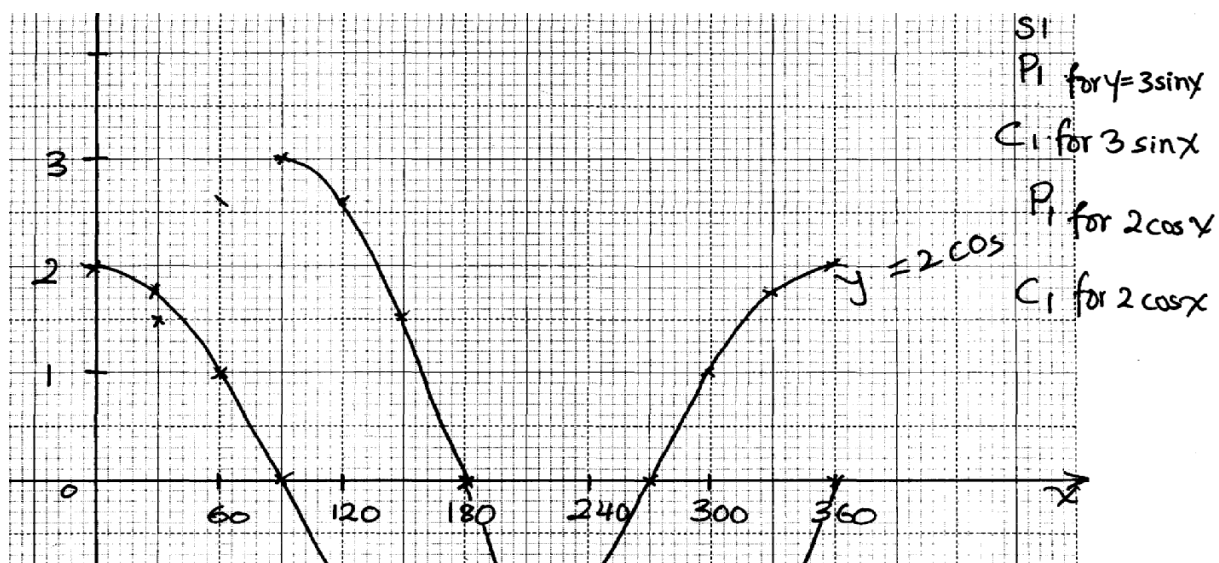
$$\frac{\sqrt{3}}{4} \times \frac{\sqrt{6}}{1}$$

$$\frac{\sqrt{18}}{4}$$

$$\frac{3}{4} \sqrt{2}$$

8. a)

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$3\sin x$		1.5			2.6	1.5					-2.6		0
$2\cos x$	2			0	-1.5			-1.7		0			



(c) (i) Amplitude = 3

(ii) $x = 36^\circ$

$x = 216^\circ$

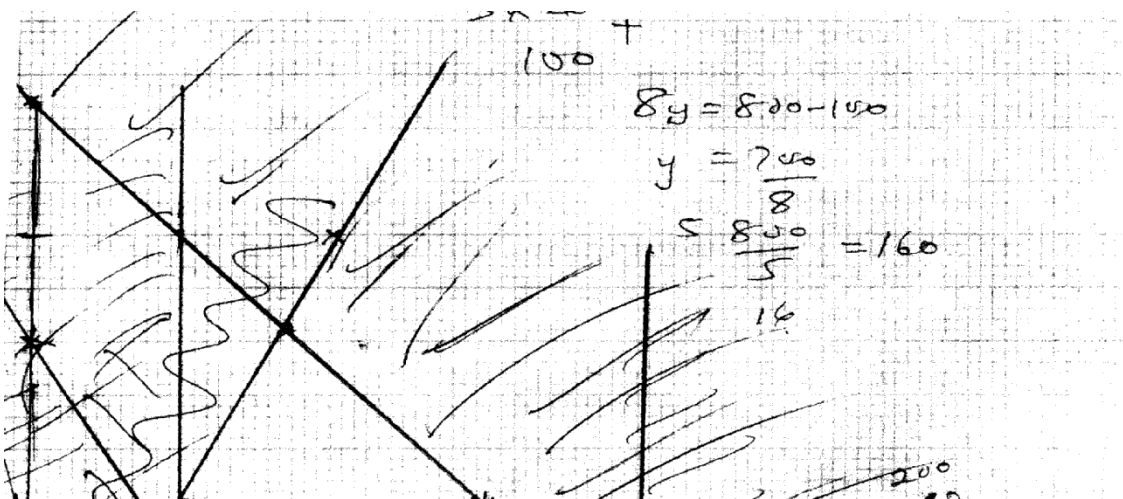
(iii) $33^\circ \leq x \leq 213^\circ$

9.

x	0	90	180	270	360	450	540	630	720	810
$\sin \frac{1}{2}x$	0	0.71	1	0.71	0	-0.71	-1	-0.71	0	0.71
$3\sin(\frac{1}{2}x + 60)$	2.6	2.9	1.5	-0.7 8	-2.6	2.9	-1.5	0.78	2.6	2.9

10.

x	0°	30°	60°	90°	120°	150°	180°
$2 \sin x$	0	1	1.73	2	1.73	1.00	0
$1 - \cos x$	1	0.13	0.50	1	0.06	1.87	2



11. $\sin(x + 30) = 0.5$
 $x + 30 = 30^\circ$
 $x = 0$
 $0, 180, 360$

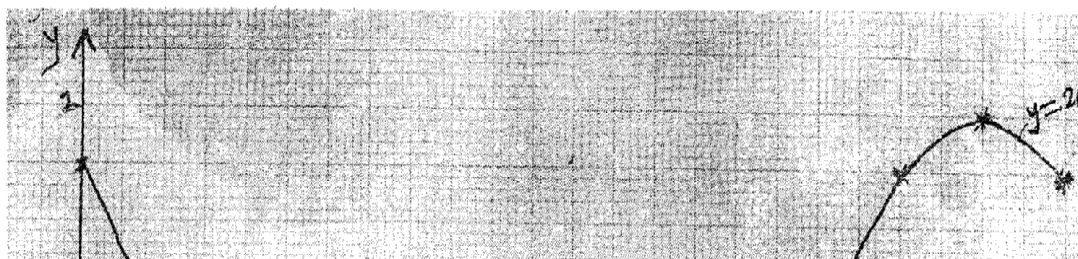
12. (c) $10\sin x = -1/50 + 5$
 $Y = -1/50 + 5$

X	0	50
y	5	4

$$X_1 = 28^\circ \pm 1$$

$$X_2 = 70^\circ \pm 1$$

12.



- b) i) amplitude = 1
 ii) Period = 360°
 iii) $45^\circ, 219^\circ$

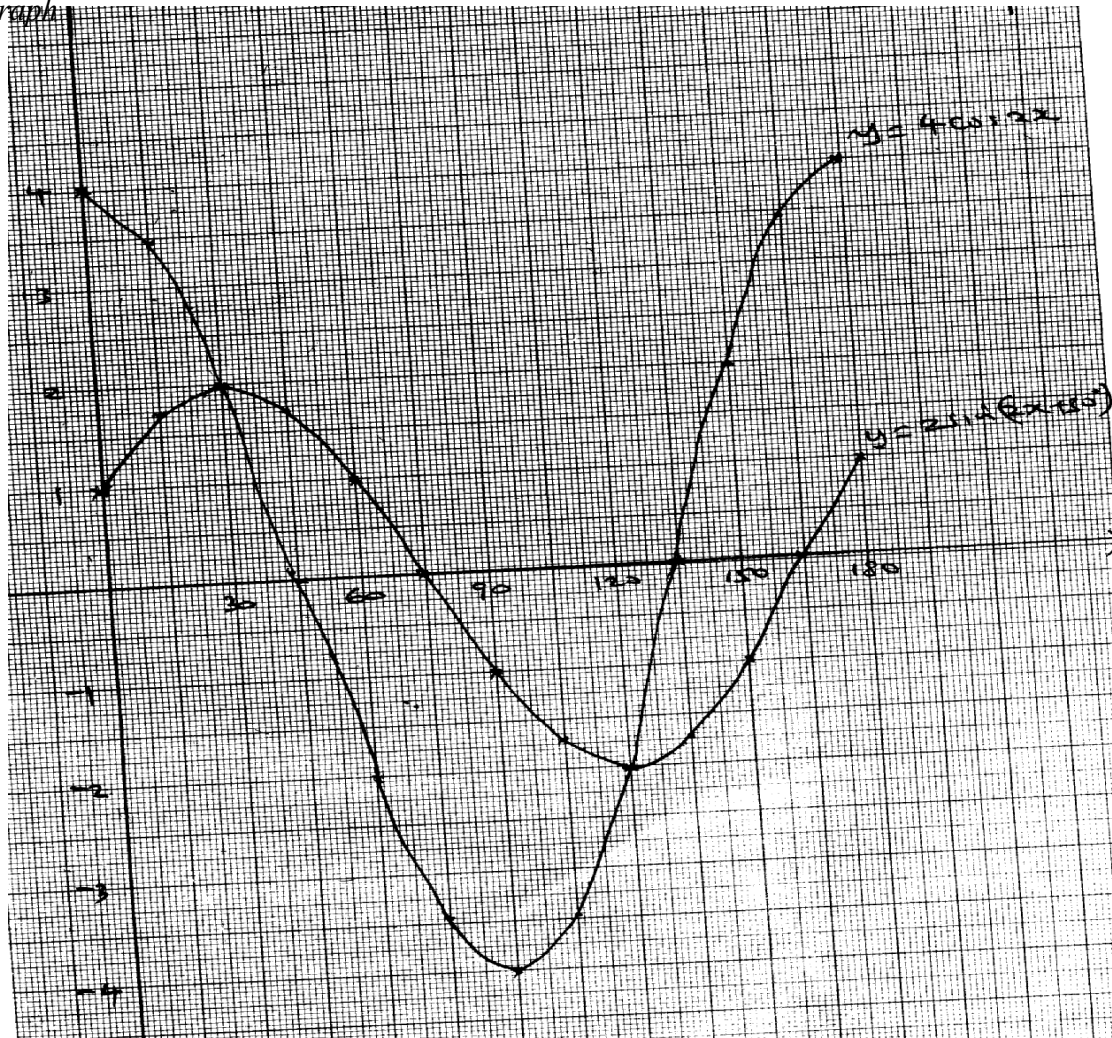
13. $2\theta + 10 = 210^\circ, 330^\circ, 570^\circ, 690^\circ$
 $2\theta = 200, 320, 560, 680$
 $= 100^\circ, 160^\circ, 280^\circ, 340^\circ$
 $= \frac{5\pi}{90}, \frac{8\pi}{90}, \frac{14\pi}{90}, \frac{17\pi}{90}$

14. $4\sin 2x + 4\cos x - 5 = 0$
 $4(1 - \cos 2x) + 4\cos x - 5 = 0$
 $4\cos 2x - 4\cos x + 1 = 0$
 $4\cos 2x - 2\cos x - 2\cos x + 1 = 0$
 $(2\cos x - 1)^2 = 0$
 $X = 60^\circ, 300^\circ$

15.

x	15°	60°	150°	165°
$4 \cos 2x$	3.46			3.46
$2 \sin (2x + 30^\circ)$		1.00	-1.00	

(b) graph



(c)(i) Amplitude = 4

(ii) period = 180°

(d) $x = 30^\circ, 120^\circ$