

**GATITU SECONDARY SCHOOL P.O. BOX 327 - 01030 GATUNDU
FORM 3 MATHEMATICS MIDTERM EXAM TERM ONE 2012.**

Answer all questions

1. Form the quadratic equations whose roots are 5 and $-1/3$ (2mks)

$$x = 5$$

or

$$x = -\frac{1}{3}$$

$$(x-5)(x+\frac{1}{3}) = 0$$

$$x^2 + \frac{1}{3}x - 5x - \frac{5}{3} = 0$$

$$\cancel{x^2 - 16x + 5} = 0$$

$$\cancel{x^2 + \frac{1}{3}x - 5} = 0$$

$$x^2 - \frac{14}{3}x - \frac{5}{3} = 0$$

2. The root of the quadratic equation $x^2 + px - q = 0$ are 1 and -5

Find the values of p and q (3mks)

$$(x-1)(x+5) = 0$$

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

$$x^2 + 4x - 5 = 0$$

$$p = 4$$

$$q = 5$$

3. Fill in the blanks the missing terms in the following to make them perfect squares.

i) $x^2 - \underline{\quad} + 4$

$$(\frac{b}{2})^2 = ac$$

$$(\frac{b}{2})^2 = 4$$

$$\frac{b^2}{4} = 4$$

$$b^2 = 16$$

$$b = 4$$

$$x^2 - 4x + 4$$

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

ii) $\underline{\quad} - 12x + x^2$

$$(-\frac{b}{2})^2 = c$$

$$36$$

$$3x^2 - 12x + 36$$

$$=$$

iii) $x^2 - \frac{2}{3}x + \underline{\quad}$ (6mks)

$$(\frac{-\frac{2}{3}}{2})^2 = c$$

$$(\frac{-\frac{4}{3}}{2})^2 = c$$

$$(\frac{16}{9}) = c$$

$$x^2 - \frac{2}{3}x + \frac{16}{9}$$

$$=$$

$$x^2 + \frac{2}{3}x + \frac{1}{9}$$

4. If $\cos \theta = 15/17$ and $270^\circ \leq \theta \leq 360^\circ$, Find $\sin \theta$ and $\tan \theta$ (3mks)

$$\begin{array}{l} \cos \theta = 0.8823 \\ \theta = 28.07^\circ \\ \theta = 331.93^\circ \end{array} \quad \left| \begin{array}{l} \sin 331.93 \\ -0.4706 \\ \tan 331.93 \\ -0.5333 \end{array} \right|$$

5. Find the smallest and the greatest difference between

a) 28.0 cm and 16.4 cm (2mks)

$$\begin{array}{r} 28.05 \\ 16.45 \\ \hline 11.7 \end{array}$$

$$\text{MAX} = \begin{array}{r} 28.05 \\ - 16.35 \\ \hline 11.7 \end{array}$$

b) 0.05 km and 0.082 km (2mks)

$$\begin{array}{r} 0.055 \\ 0.0825 \\ \hline 0.0375 \end{array}$$

$$\text{MAX} = \begin{array}{r} 0.0550 \\ - 0.0815 \\ \hline -0.0265 \end{array}$$

c) 4.36 kg and 2.37 kg (2mks)

$$\begin{array}{r} 4.365 \\ 2.375 \\ \hline 2.000 \end{array}$$

$$\begin{array}{r} \text{min} \\ 27.95 \\ -16.45 \\ \hline 11.5 \end{array}$$

$$\begin{array}{r} \text{max} \\ 0.0450 \\ -0.0825 \\ \hline -0.0375 \end{array}$$

$$\begin{array}{r} \text{MAX} \\ 4.365 \\ -2.365 \\ \hline 2.000 \end{array}$$

$$\begin{array}{r} \text{min} \\ 4.355 \\ -2.375 \\ \hline 1.98 \end{array}$$

6. A housewife ordered 1.75m of material for a table cloth. If the actual measurement was 1.4 calculate the percentage error. (2mks)

$$1.75 \text{m.}$$

$$\frac{175}{100} - \frac{5}{3} \cdot \frac{525 - 500}{300}$$

$$\frac{25}{300} \div \frac{5}{3} \times 100$$

$$\frac{25}{300} \times \frac{3}{5} \times 100$$

$$\underline{\underline{5\%}}$$

7. Simplify i)

$$\frac{3}{3+\sqrt{2}} - \frac{1}{3-\sqrt{2}} \quad (3 \text{mks})$$

$$\frac{3(3-\sqrt{2}) - 1(3+\sqrt{2})}{(3+\sqrt{2})(3-\sqrt{2})}$$

$$\frac{9-3\sqrt{2}-3-\sqrt{2}}{9-3\sqrt{2}+3\sqrt{2}-14}$$

$$\frac{6-4\sqrt{2}}{9-2}$$

$$\underline{\underline{6-4\sqrt{2}}}$$

ii) $\frac{3}{4-\sqrt{2}} + \frac{\sqrt{2}}{4-\sqrt{2}} \quad (3 \text{mks})$

$$\frac{3(4+\sqrt{2}) + \sqrt{2}(4+\sqrt{2})}{(4+\sqrt{2})(4-\sqrt{2})}$$

$$\frac{12+3\sqrt{2}+4\sqrt{2}+2}{16-2}$$

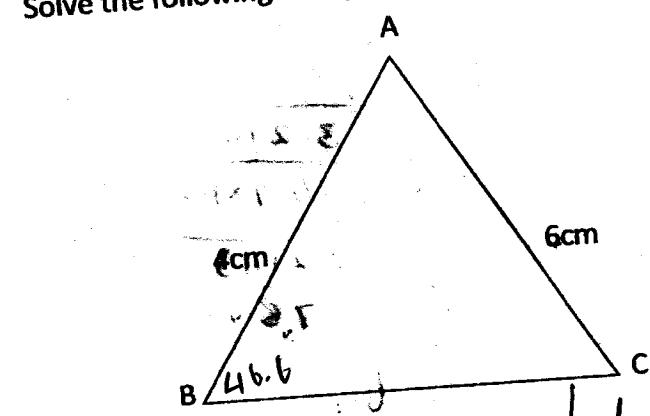
$$\underline{\underline{1+\frac{1}{2}\sqrt{2}}}$$

or

$$\frac{2+\sqrt{2}}{2}$$

$$\underline{\underline{1+\frac{1}{2}\sqrt{2}}}$$

8. Solve the following triangles (4mks)



$$b^2 = 8^2 + 4^2 - 2 \times 8 \times 4 \cos B$$

$$3b = 64 + 16 - 64 \cos B$$

$$3b - 80 = -64 \cos B$$

$$\frac{-44}{-64} = \frac{-64 \cos B}{-64}$$

$$\cos B = 0.6875$$

$$B = \underline{\underline{46.6}}$$

$$\frac{b}{\sin 46.6} = \frac{8}{\sin A}$$

$$\sin A = \frac{8 \sin 46.6}{6}$$

$$\sin A = \frac{8 \times 0.7266}{6}$$

$$\sin A = 0.9688$$

$$A = \underline{\underline{75.6}}$$

$$C = 180 - (75.6 + 46.6)$$

$$180 - 122.2^\circ$$

$$C = \underline{\underline{57.8^\circ}}$$

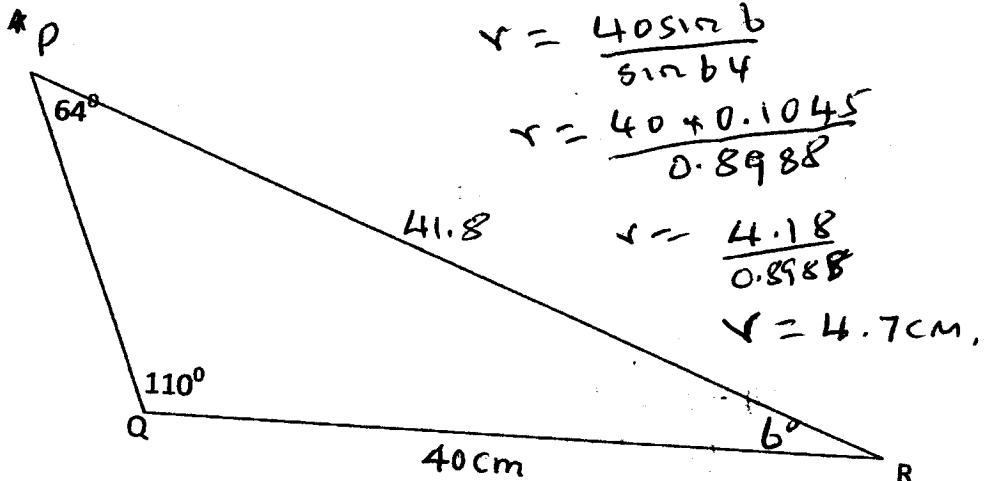
$$\frac{40}{\sin 64} = \frac{qr}{\sin 110}$$

$$qr = \frac{40 \sin 110}{\sin 64}$$

$$qr = \frac{40 \times 0.9397}{0.8988}$$

$$qr = 41.8 \text{ cm}$$

(4mks)



$$\frac{40}{\sin 64} = \frac{r}{\sin b}$$

$$r = \frac{40 \sin b}{\sin 64}$$

$$r = \frac{40 + 0.1045}{0.8988}$$

$$r = \frac{41.8}{0.8988}$$

$$r = 4.7 \text{ cm.}$$

9. Use a calculator to work out the following and show your working. (2mks)

$$\text{i) } \frac{1}{\sqrt{82.49}} + \frac{3}{(0.089)^2}$$

$$\frac{1}{9.0824} + \frac{3 \times 1}{0.007921}$$

$$0.1101 + 378.74$$

$$378.85$$

$$\text{ii) } \sqrt[4]{\frac{\frac{34^x}{97} - 0.0257}{3.849 \times 1.243}}$$

$$\begin{array}{c|c|c|c|c}
w_0 & 15.9 & \log & 1.5315 \times \frac{1}{3} & \\
\hline
34 & 3.4 \times 10^1 & & 0.5105 & \\
& 3.2340 & & & \\
& - 0.0257 & & & \\
\hline
& 3.2143 & & &
\end{array}$$

$$\sqrt[4]{\frac{3.2143}{3.849 \times 1.243}}$$

$$\sqrt[4]{\frac{3.2143}{4.7843}}$$

$$\sqrt[4]{0.6718}$$

$$0.9053$$

10a) Draw the graph of $y=2x^2+5x-12$ for $-8 \leq x \leq 4$

x	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
$2x^2$	128	98	72	50	32	18	8	2	0	2	8	18	32
$5x$	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
y	76	51	30	13	0	-9	-14	-15	-12	-5	6	21	40

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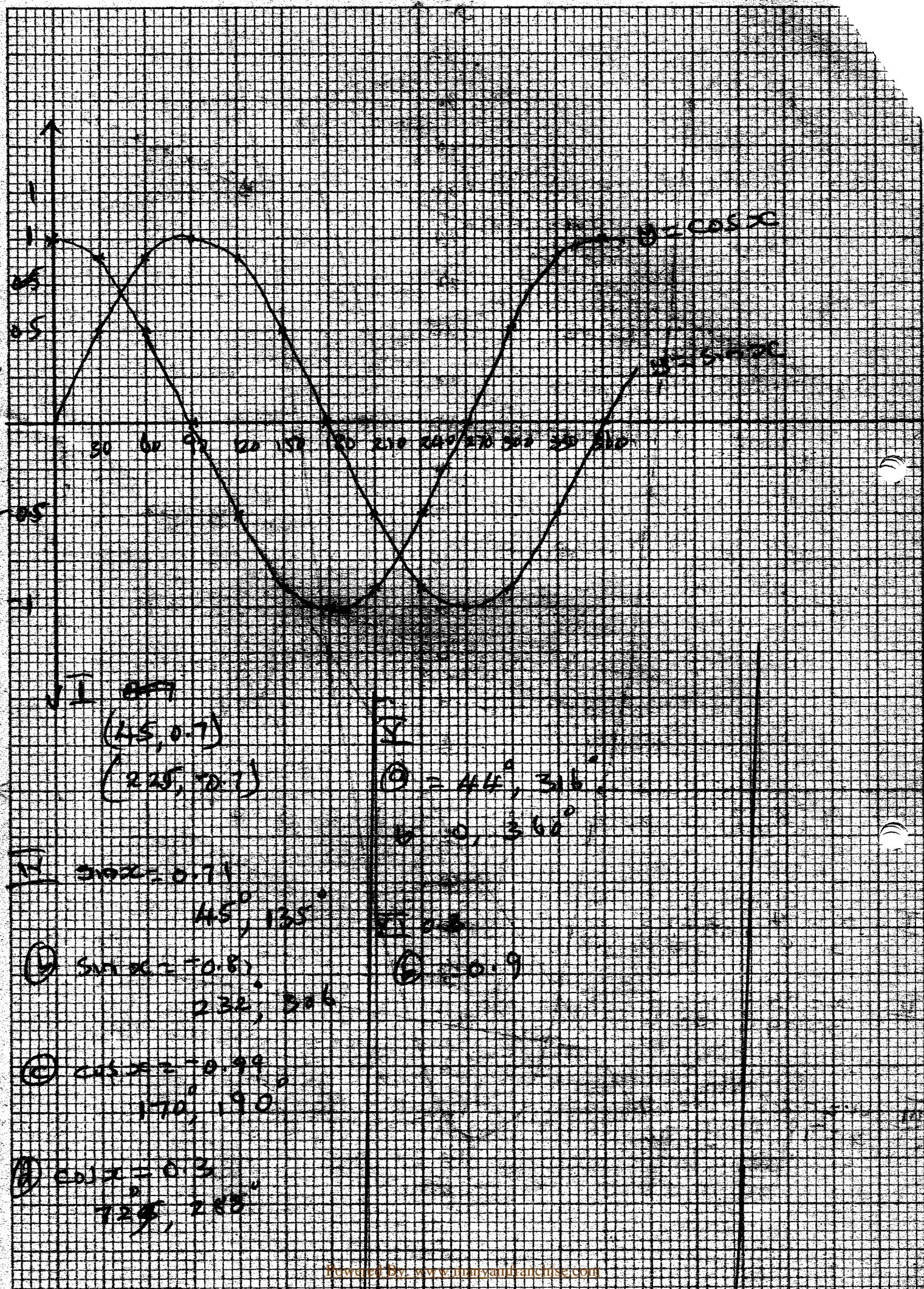
-9 -8 -7 -6

$$\text{I} \quad x = -4, \quad x = 1.5 \\ y = 0, \quad y = 0$$

$$\text{II} \quad x = -5, \quad x = 3 \\ y = -10, \quad y = 0$$

$$\text{III} \quad x = -2.5, \quad x = 0.5 \\ y = -7.5, \quad y = 7.5$$

$$y = \frac{1}{3}x - 10$$



$$\begin{aligned}y &= 2x^2 + 5x - 12 \\0 &= 2x^2 + 5x - 12 \\y &= 0\end{aligned}$$

$$\begin{aligned}y &= 2x^2 + 5x - 12 \\0 &= -3x^2 - 7x + 3\end{aligned}$$

$$\begin{aligned}3y &= 6x^2 + 15x - 3 \\0 &= -6x^2 - 14x + 6 \\3y &= x - 30 \\y &= \frac{1}{3}x - 10 \\x &\mid \begin{array}{|c|c|c|c|c|}\hline -3 & 0 & 3 & 6 & 9 \\ \hline \end{array} \\y &\mid \begin{array}{|c|c|c|c|c|}\hline -11 & -10 & -9 & -8 & -7 \\ \hline \end{array}\end{aligned}$$

b) Use your graph to solve

- i) $2x^2 + 5x - 12 = 0$ (1mk)
- ii) $x^2 + x - 6 = 0$ (2mks)
- iii) $3 - 7x - 3x^2 = 0$ (2mks)

$$\begin{aligned}\text{II } y &= 2x^2 + 5x - 12 \\0 &= 2x^2 + 2x - 12 \\y &= 3x \\x &\mid \begin{array}{|c|c|c|c|c|}\hline 0 & 1 & 2 & 3 \\ \hline \end{array} \\y &\mid \begin{array}{|c|c|c|c|c|}\hline 3 & 6 & 9 \\ \hline \end{array}\end{aligned}$$

11. i) On the same axes draw the graph of $y = \sin x$ and $y = \cos x$ for $0 \leq x \leq 360^\circ$ (5MKS)

ii) State the coordinates of the two points of intersection (1mk)

iii) What transformation maps the graph of $y = \sin x$ onto the graph of $y = \cos x$ (1mk)

iv) From your graph find the value of x if

- a) $\sin x = 0.71$ (1/2mks)
- b) $\sin x = -0.81$ (1/2mks)
- c) $\cos x = -0.99$ (1/2mks)
- d) $\cos x = 0.3$ (1/2mks)

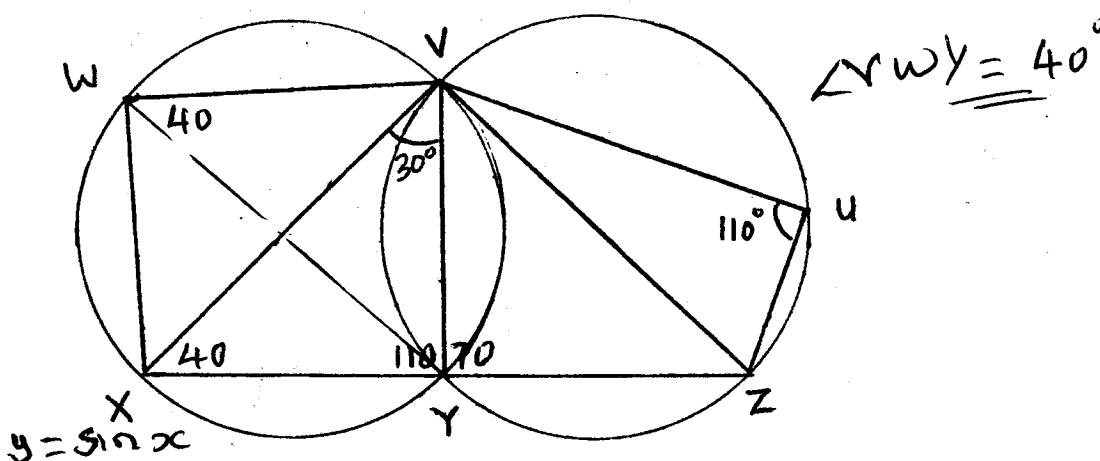
v) Use your graph to find the angle whose cosines are

- a) 0.7 (1mk)
- b) 1 (1mk)

vi) Use your graph to find the sin of

- a) 53° (1/2mk)
- b) 106° (1/2 mk)

12. In the figure below $\angle VUZ = 110^\circ$ and $\angle XZY = 30^\circ$. Find the value of $\angle WZY$ (3mks)



x	0	30	60	90	120	150	180	210	240	270	300	330	360
y	0	0.5	0.9	1	0.9	0.5	0	-0.5	-0.9	-1	-0.9	-0.5	0

$$y = \cos x$$

x	0	30	60	90	120	150	180	210	240	270	300	330	360
y	1	0.9	0.5	0	-0.5	-0.9	-1	-0.9	-0.5	0	0.9	0.5	1

13. Triangle OAB is such that $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$. C lies on \vec{OB} such that $\vec{OC} : \vec{CB} = 1:1$. D lies on \vec{AB} such that $\vec{AD} : \vec{DB} = 1:1$ and E lies on \vec{OA} such that $\vec{OE} : \vec{AE} = 3:1$

Find in terms of \mathbf{a} and \mathbf{b}

a) \vec{OC} (1mk)

$$\vec{OC} = \frac{1}{2}\mathbf{b}$$

$$\vec{OD} = \mathbf{b} + \frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{b}$$

$$\vec{OD} = \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{a}$$

b) \vec{OD} (1mk)

$$\vec{OD} = \vec{OB} + \vec{BD}$$

$$\vec{OD} = \mathbf{b} + \frac{1}{2}\vec{BA}$$

$$\vec{OD} = \mathbf{b} + \frac{1}{2}(\mathbf{a} - \mathbf{b})$$

c) \vec{OE} (1mk)

(6) $\vec{DE} = \frac{4}{3}\mathbf{a}$.

(7) $\vec{BA} = \vec{BO} + \vec{OA}$

$$\vec{BA} = \mathbf{a} - \mathbf{b}$$

d) \vec{BA} (1mk)

(8) $\vec{CD} = \vec{CO} + \vec{OD}$

$$\vec{CD} = -\frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{b} + \frac{1}{2}\mathbf{a}$$

$$\vec{CD} = \frac{1}{2}\mathbf{a}$$

e) \vec{CD} (1mk)

(9) $\vec{DE} = \vec{DA} + \vec{AE}$

$$\vec{DE} = -\frac{1}{2}(\vec{BA}) + \frac{1}{4}\mathbf{a}$$

$$\vec{DE} = -\frac{1}{2}(\mathbf{a} - \mathbf{b}) + \frac{1}{4}\mathbf{a}$$

$$\vec{DE} = +\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b} + \frac{1}{4}\mathbf{a}$$

$$\vec{DE} = -\frac{1}{4}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

f) \vec{DE} (2mks)

(10) $\vec{EC} = \vec{EA} + \vec{OC}$

$$\vec{EC} = -\frac{4}{3}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

g) \vec{EC} (2mks)

