

(35)

 θ $\sin \theta$ $\cos \theta$ $\tan \theta$

||

 $\frac{\sin \theta}{\cos \theta}$ $\cos \theta$ $\sin \theta = \frac{y}{r}$ $\cos \theta = \frac{x}{r}$

0

 $\pi/6$ $\pi/4$ $\pi/3$ $\pi/2$

0

 $\frac{1}{2}$ $\frac{\sqrt{2}}{2}$ $\frac{\sqrt{3}}{2}$ $\frac{\sqrt{4}}{2}$

1

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

0

0

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

1

 $\sqrt{3}$

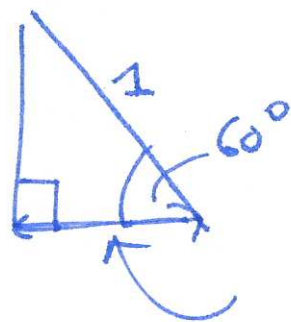
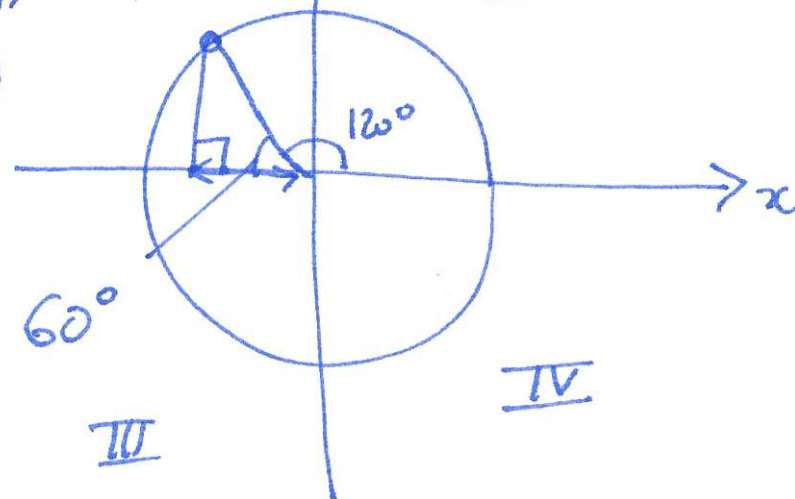
undefined

①

②

$$\cos(120^\circ)$$

$(\cos\theta, \sin\theta)$ (x, y) I



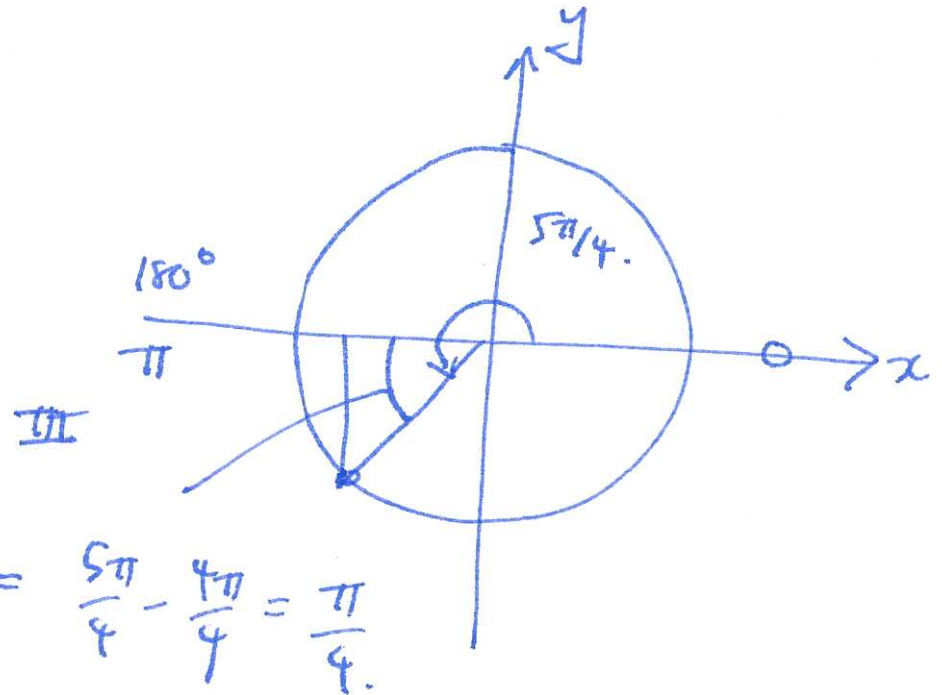
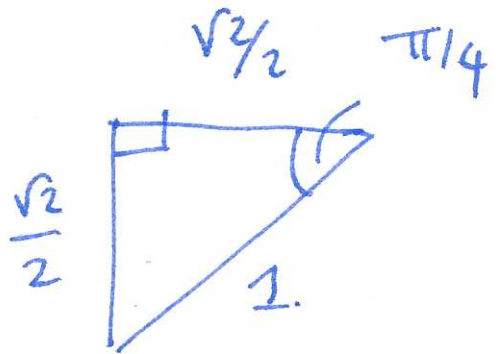
$$\cos(60^\circ) = \cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$

$$\frac{60 \times \pi}{180} = \frac{\pi}{3}$$

$$\cos(120^\circ) = -\frac{1}{2}$$

Q8 b) ii) $\tan\left(\frac{5\pi}{4}\right)$.

(3)



$$\frac{5\pi}{4} - \pi = \frac{5\pi}{4} - \frac{4\pi}{4} = \frac{\pi}{4}$$

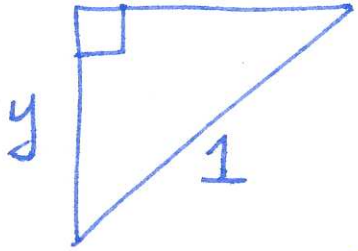
$$\sin\left(\frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

$$\cos\left(\frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

$$\tan\left(\frac{5\pi}{4}\right) = +1$$

(4)

Q9 $\boxed{\cos \theta = -\frac{3}{5}}$ $\theta > 0$ in quadrant III



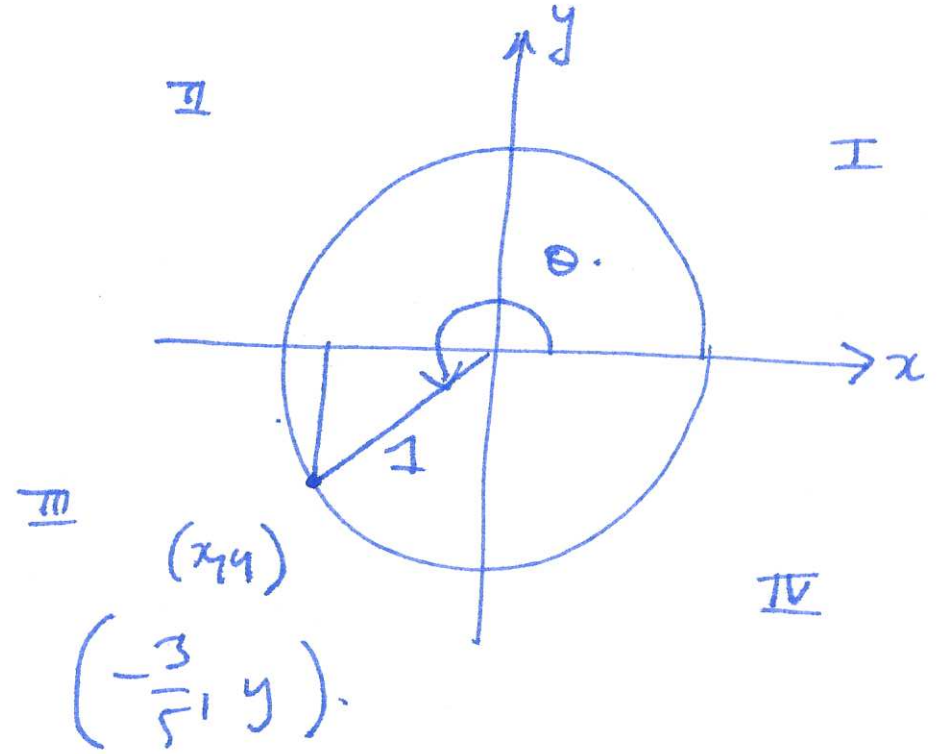
$$x^2 + y^2 = 1$$

$$\left(-\frac{3}{5}\right)^2 + y^2 = 1$$

$$\frac{9}{25} + y^2 = 1$$

$$y^2 = 1 - \frac{9}{25} = \frac{25-9}{25} = \frac{16}{25}$$

$$y = \pm \frac{4}{5}$$



$$y = -\frac{4}{5}$$

$$\boxed{\sin \theta = y = -\frac{4}{5}}$$

(5)

$$\cos \theta = -\frac{3}{5}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{-4/5}{-3/5} = \frac{4}{3}$$

$$\sin \theta = -\frac{4}{5}$$

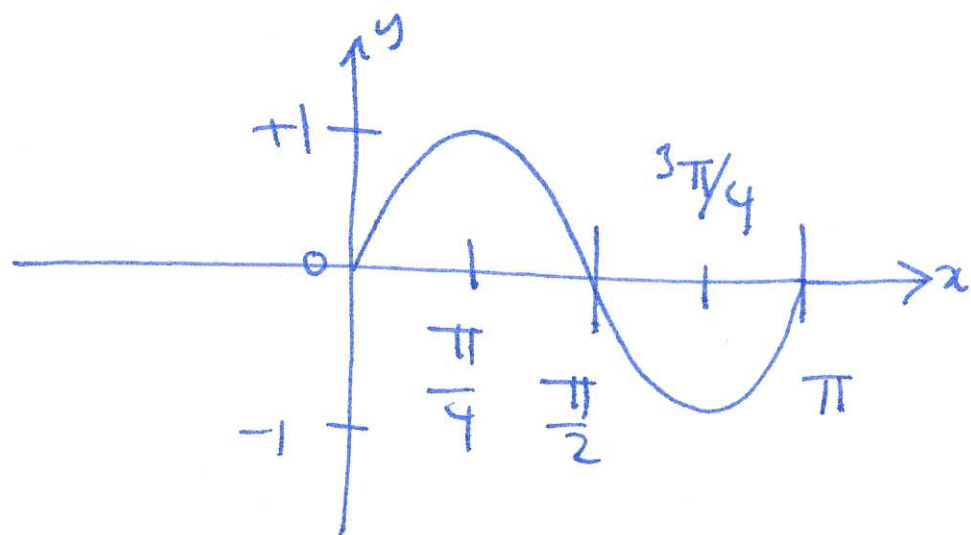
$$\cot \theta = \frac{1}{\tan \theta} = \frac{3}{4}$$

$$\sec \theta = \frac{1}{\cos \theta} = -\frac{5}{3}$$

$$\operatorname{cosec} \theta = \frac{1}{\sin \theta} = -\frac{5}{4}$$

b) $y = 3 \sin(2x)$

$y = \sin(2x) \rightarrow$

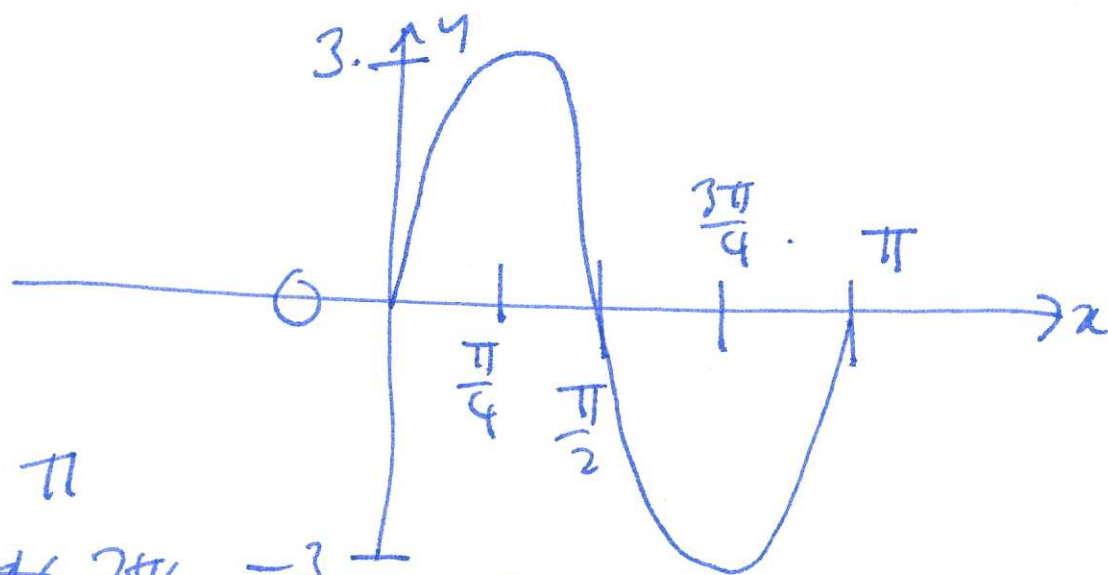
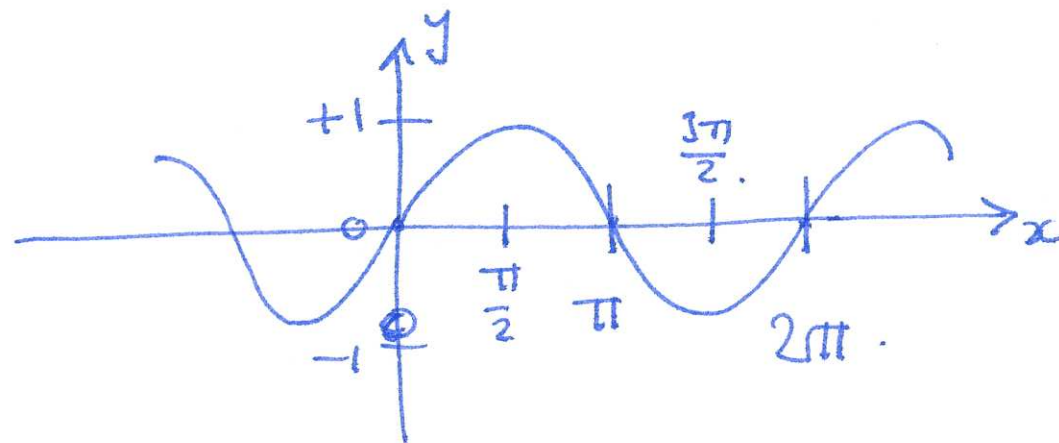


$y = 3 \sin(2x)$

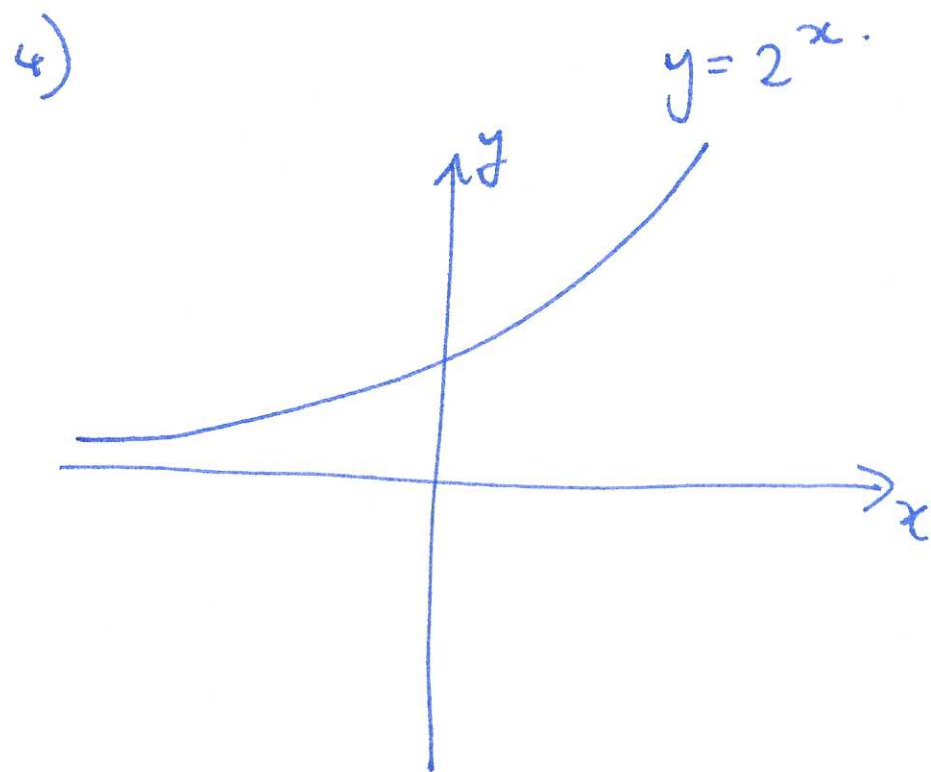
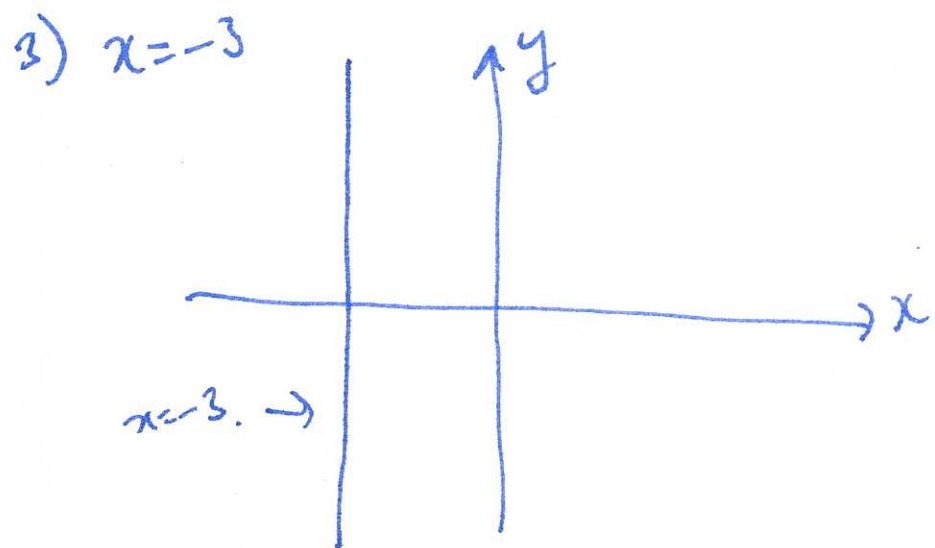
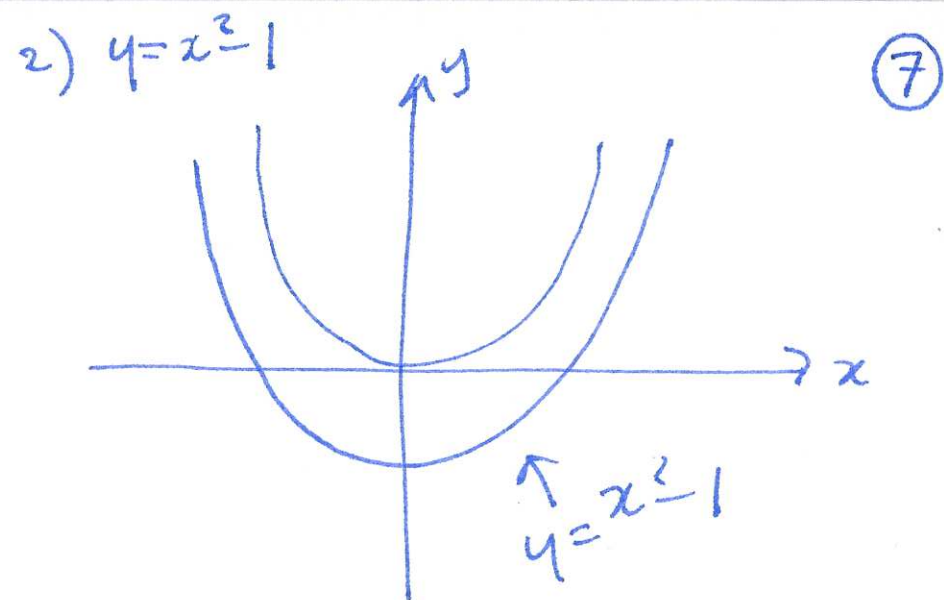
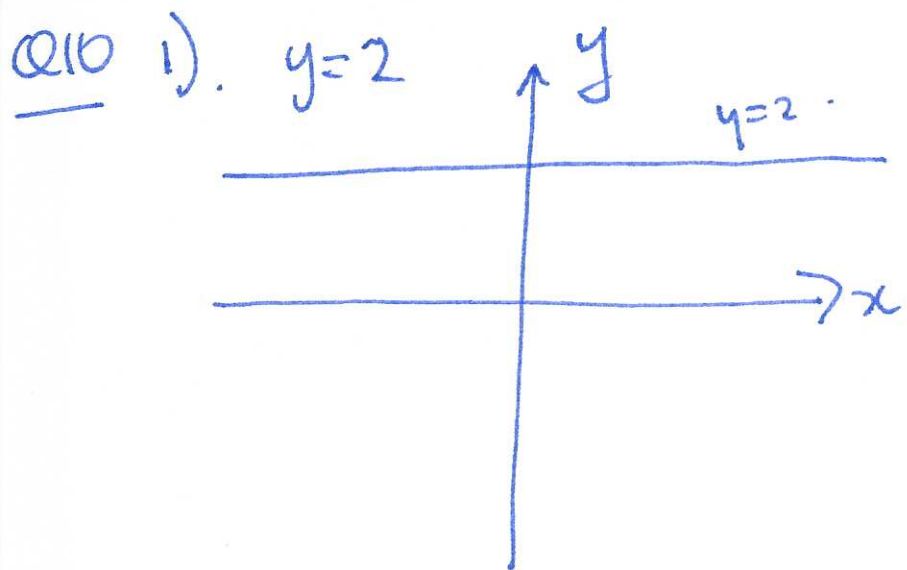
amplitude = 3 . period = π

frequency = $\frac{2\pi}{\text{period}} = \frac{2\pi}{\pi} = 2$

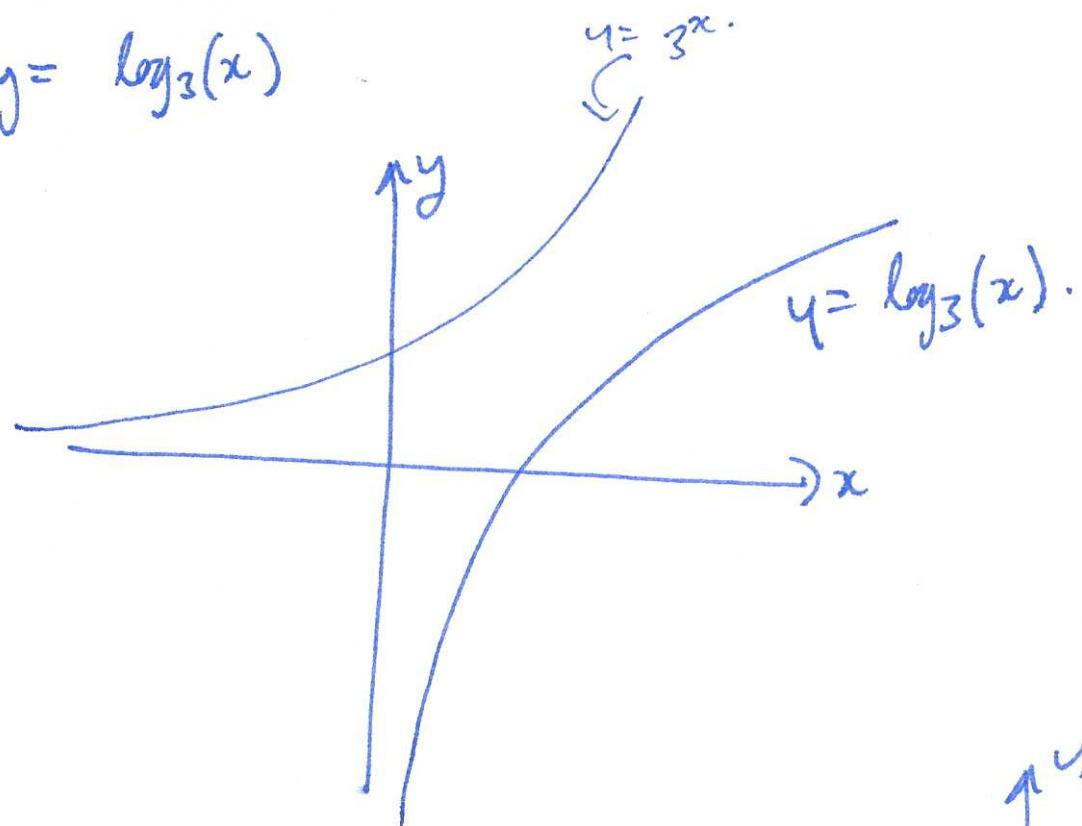
$y = \sin(x) \rightarrow$



(6)

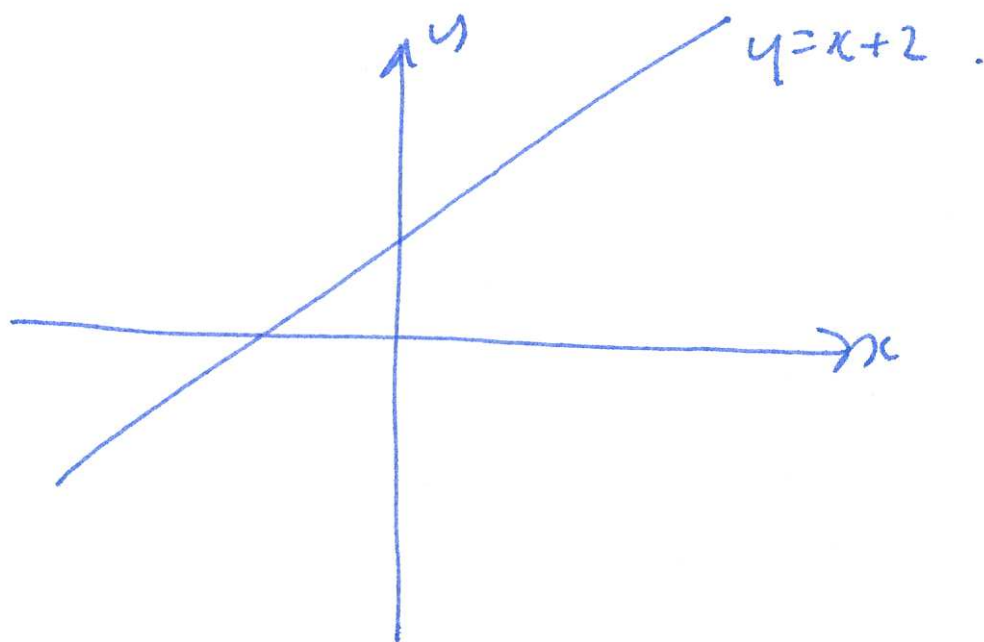


5) $y = \log_3(x)$



8

6) $y = x + 2$



9

Q1 a) (1,2) (-2,3)

$$y - y_0 = m(x - x_0)$$

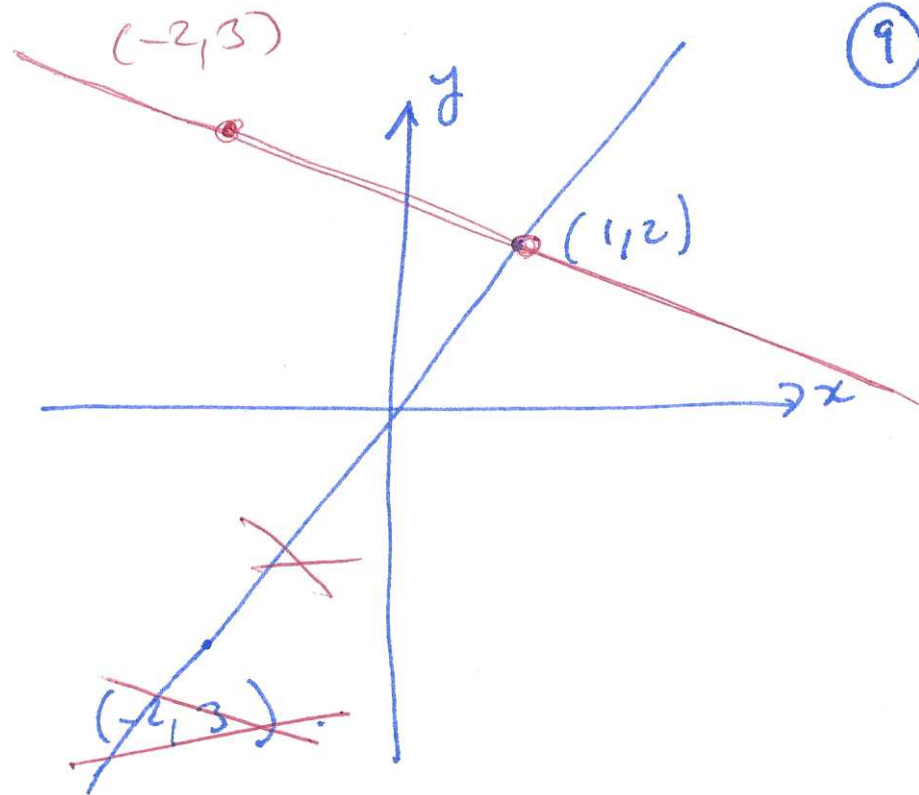
$$\text{slope} = \frac{\text{diff in } y}{\text{diff in } x}$$

$$m = \frac{3-2}{-2-1} = -\frac{1}{3}$$

$$y - 1 = -\frac{1}{3}(x - 2)$$

$$y - 1 = -\frac{1}{3}x + \frac{2}{3}$$

+ 1 + 1.



$$y = -\frac{1}{3}x + \frac{5}{3}$$

b) line with slope 3 through $(2, 2)$

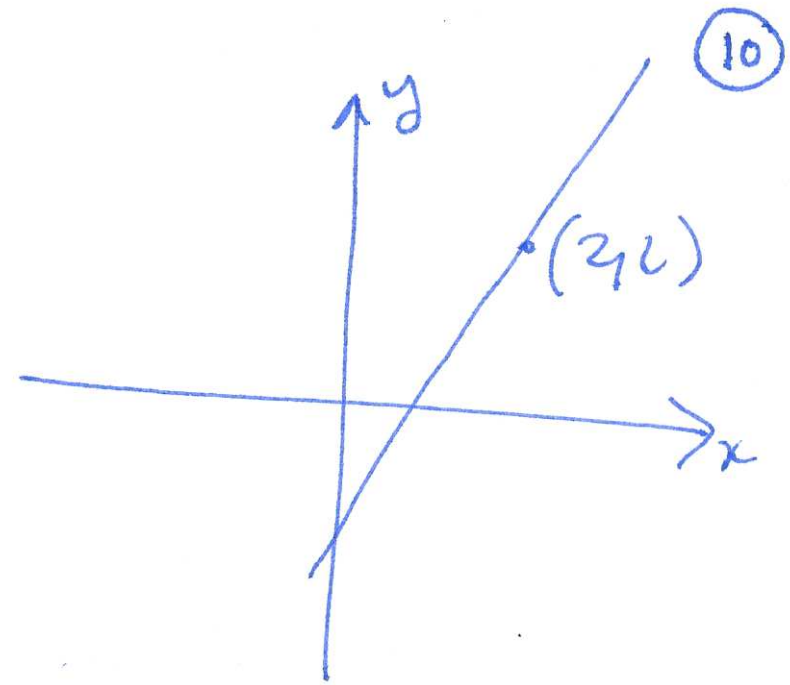
$$y - y_0 = \underset{\substack{\uparrow \\ \text{slope}}}{m} (x - x_0) .$$

(x_0, y_0) .

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

$$\underset{+2}{y - 2} = \underset{+2}{3x - 6} .$$

$$y = 3x - 4$$



c) line through origin parallel to $3x + 5y = 3$.

(11)

$$y = \cancel{mx} + mx + \underbrace{b}_{b=0}$$

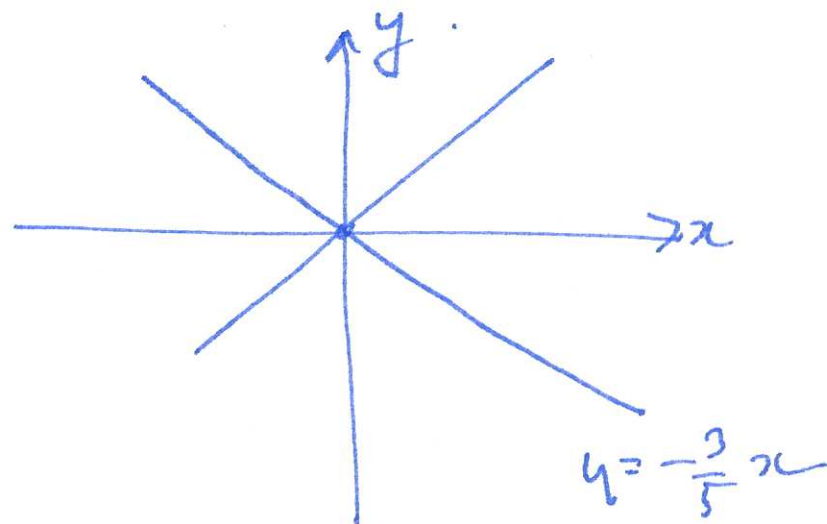
$$y = mx$$

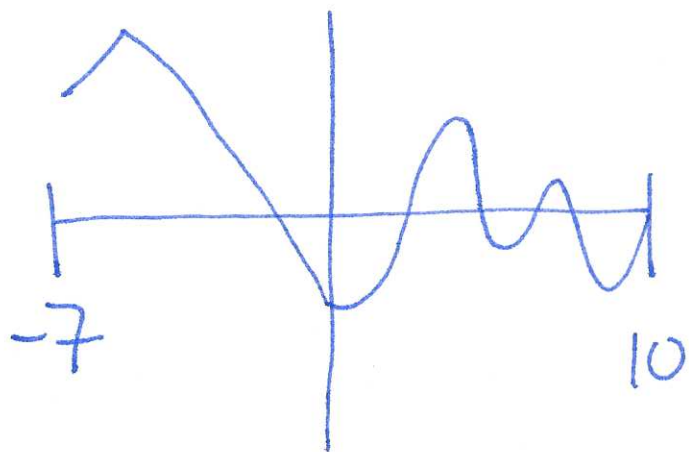
$$3x + 5y = 3$$

$$5y = 3 - 3x$$

$$y = \frac{3}{5} - \left(\frac{3}{5}\right)x \quad \text{slope } m.$$

$$y = -\frac{3}{5}x$$



Q2

- a) domain?
- b) rel min?
(x, y)

a) $[-7, 10]$.

b) 3 local minima.

$(0, -3)$

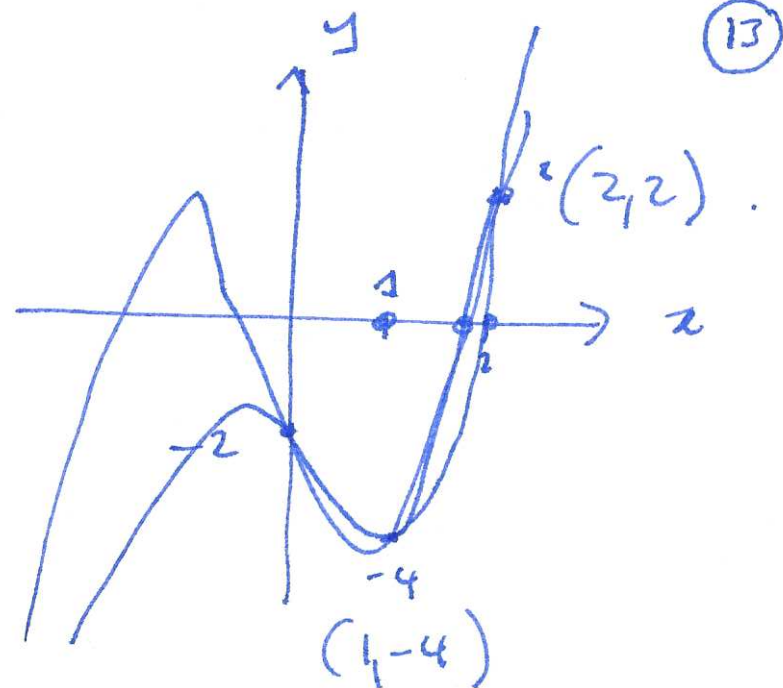
$(6, -1)$

$(9, -3)$.

Q3

$$x^3 + x^2 - 4x - 2 = 0$$

$$\approx 1.85.$$



Q4

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

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

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

$$ax^2 + bx + c = 0$$

$$\frac{-1 \pm \sqrt{1 - 4 \cdot 3 \cdot -2}}{2 \cdot 3} =$$

$$\frac{-1 \pm \sqrt{25}}{6}.$$

$$\frac{-1-5}{6}, \frac{-1+5}{6} = -1, \frac{2}{3}.$$

b)

$$\sqrt{x+25} - 2x + 16 = 0$$

$$+ 2x - 16$$

$$ax^2 + bx + c = 0$$

$$\uparrow$$

$$+ 2x - 16.$$

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

$$\left(\sqrt{x+25}\right)^2 = \left(2x - 16\right)^2$$

$$x + 25 = 4x^2 - 64x + 256$$

$$-x - 25 \quad -x - 25$$

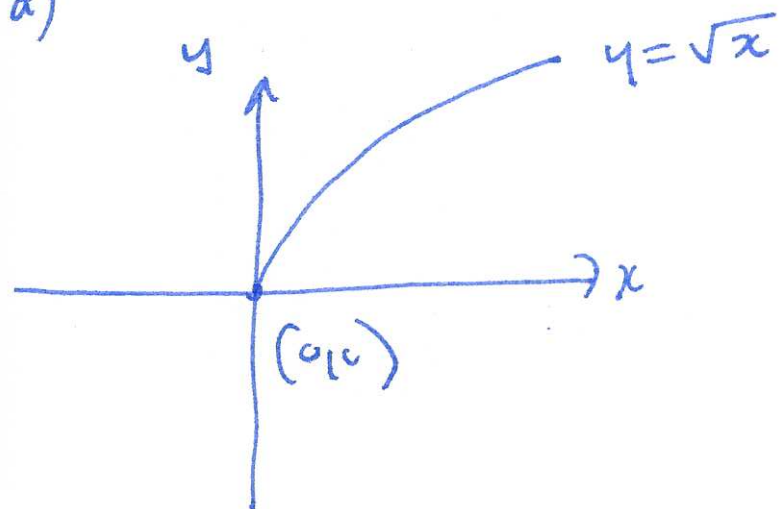
$$4x^2 - 65x + 231 = 0$$

$$\frac{88}{8} = 11$$

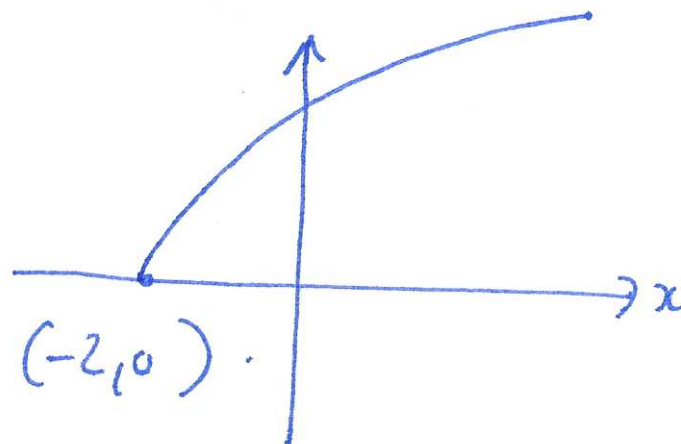
$$\frac{42}{8} = \frac{21}{4}$$

$$\frac{65 \pm \sqrt{65^2 - 4 \times 4 \times 231}}{8} = \frac{65 \pm \sqrt{529}}{8} = \frac{65 \pm 23}{8}$$

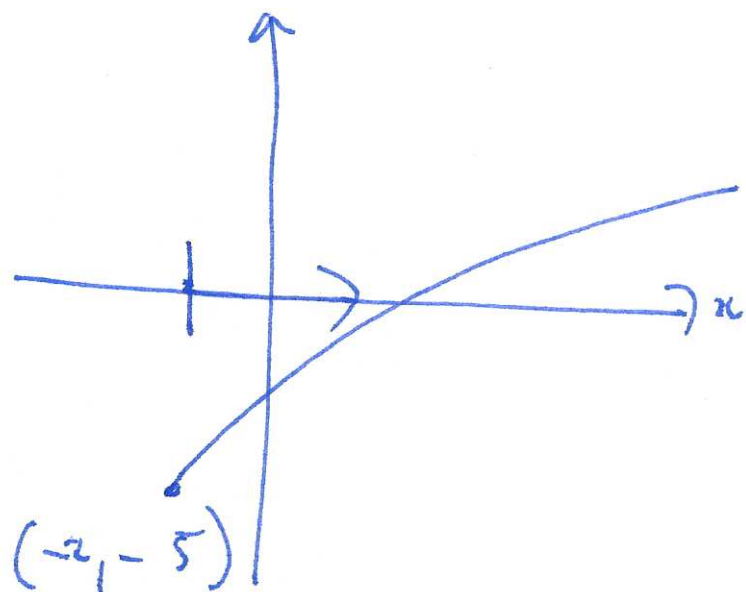
Q5
a) $f(x) = \sqrt{x+2} - 5.$



$$y = \sqrt{x+2}.$$



$$y = \sqrt{x+2} - 5$$



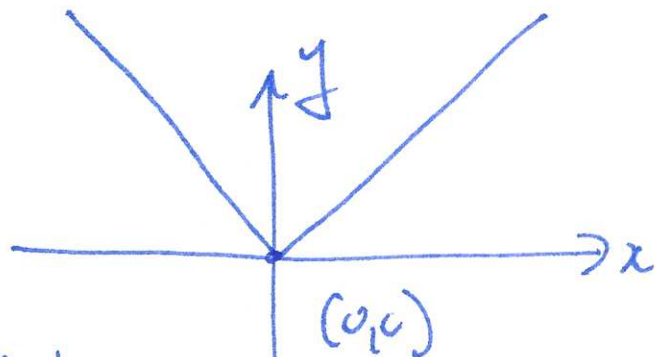
b) domain?

$$[-2, \infty).$$

$$[-2, \infty).$$

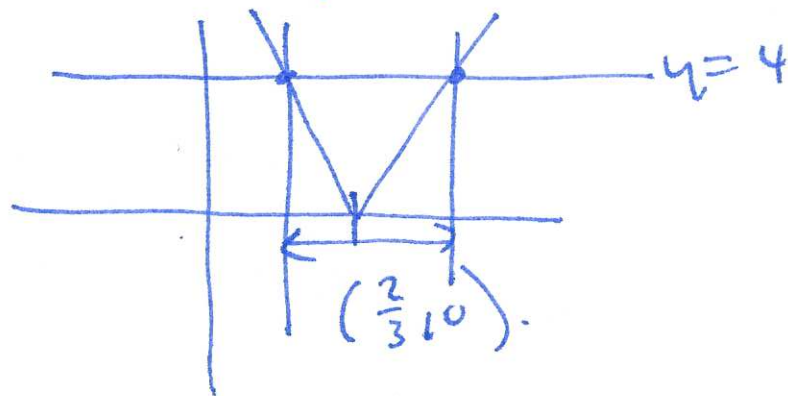
Q6 $\left| \frac{3}{2}x - 1 \right| < 4$.

① $y = |x|$



$$\left| \frac{3}{2} \left(x - \frac{2}{3} \right) \right| < 4$$

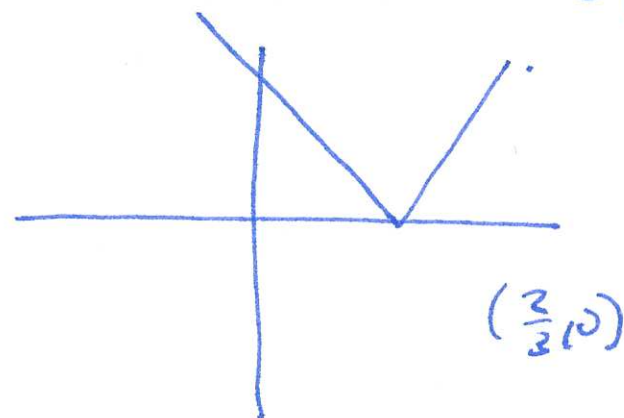
$$y = \left| \frac{3}{2} \left(x - \frac{2}{3} \right) \right| < 4$$



$$y = |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x \leq 0 \end{cases}$$

①⑥

$$y = \left| x - \frac{2}{3} \right|$$



Q6

(17)

$$\left| \frac{3}{2}x - 1 \right| < 4$$

positive

$$\frac{3}{2}x - 1 < 4 \leadsto$$

$$\frac{3}{2}x < 5.$$

$$3x < 10.$$

$$x < \frac{10}{3}.$$

negative

$$-\frac{3}{2}x + 1 < 4.$$

$$-\frac{3}{2}x < 3.$$

$$\frac{3}{2}x > -3.$$

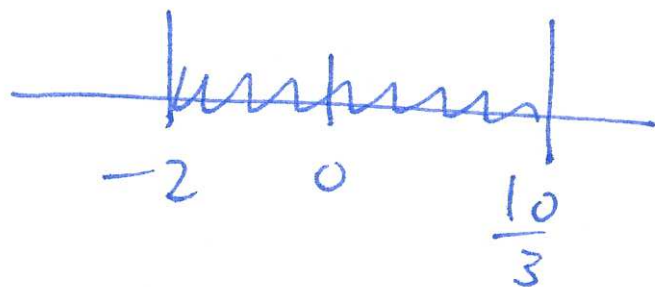
$$3x > -6$$

$$x > -2$$

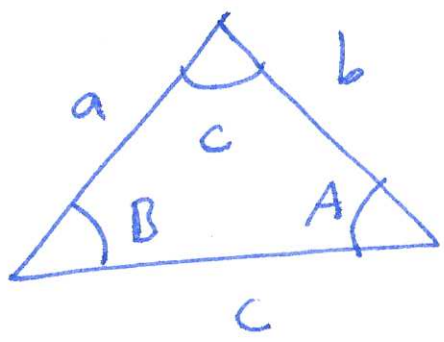
$$\left(-2, \frac{10}{3}\right).$$

~~10/3~~

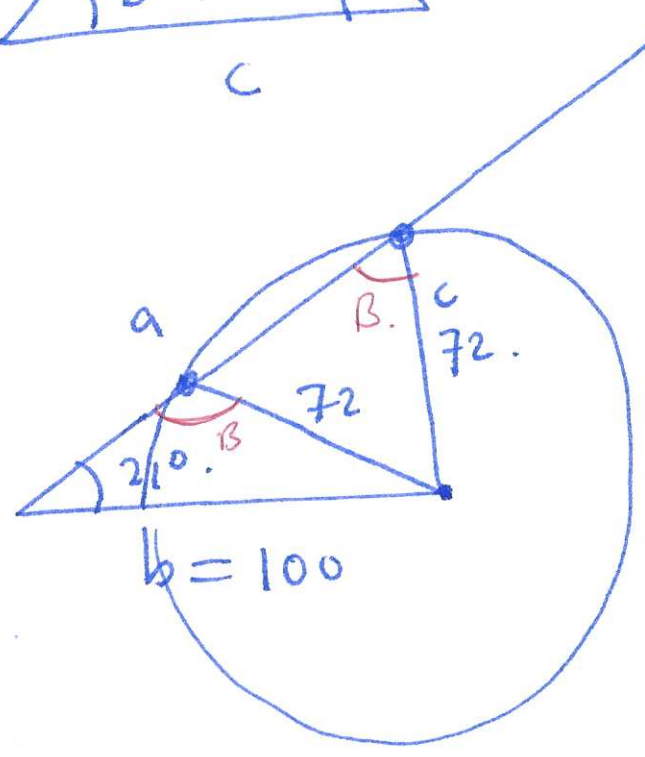
$$-2 < x < \frac{10}{3}.$$



$a = 72$
 $b = 100$
 $A = 21^\circ$



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

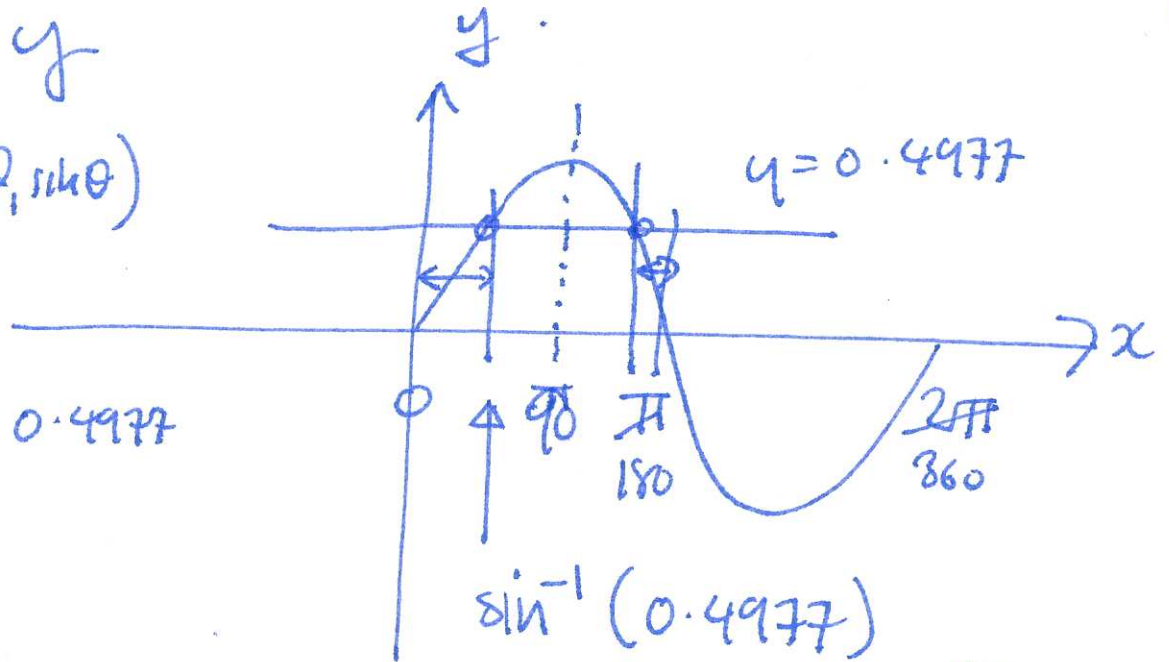
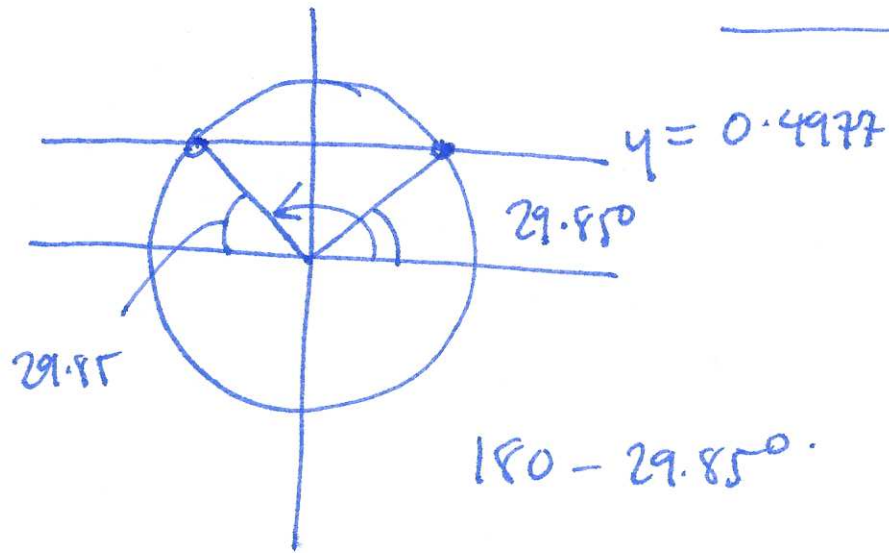


$$\frac{\sin A}{a} = \frac{\sin 21^\circ}{72} = \frac{\sin B}{100}$$

$$\sin B = \frac{100}{72} \sin 21^\circ$$
$$\approx 0.4977$$

$$\sin B = 0.4977 = y$$

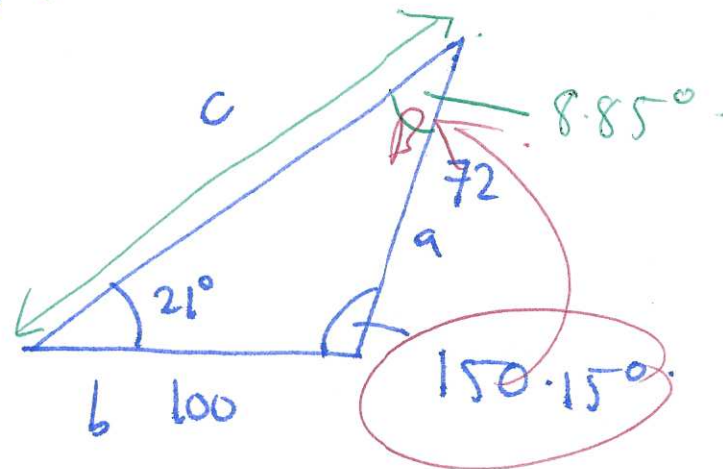
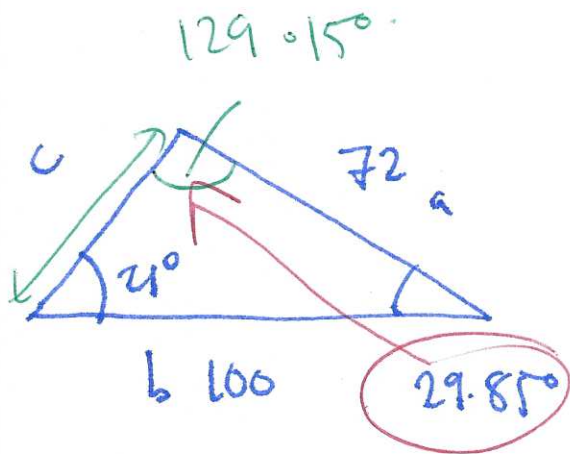
$$(x, y) \quad (\cos \theta, \sin \theta)$$



$$\sin^{-1}(0.4977) \approx 29.85^\circ$$

$$180 - 29.85^\circ$$

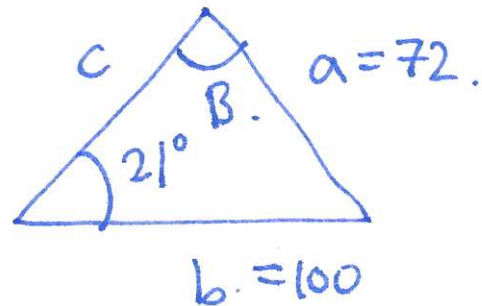
$$150.15^\circ$$



$$a = 72$$

$$b = 100$$

$$A = 21^\circ$$



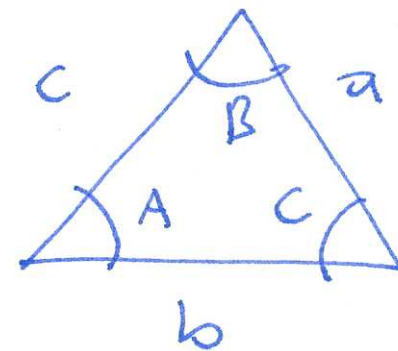
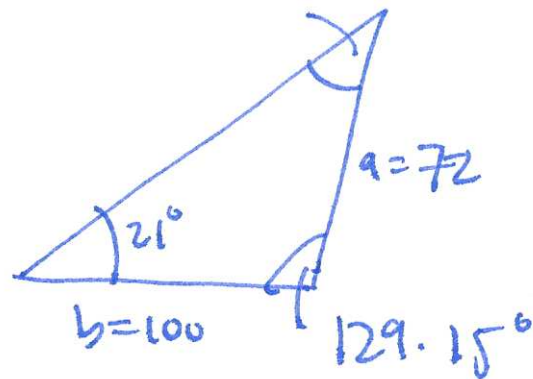
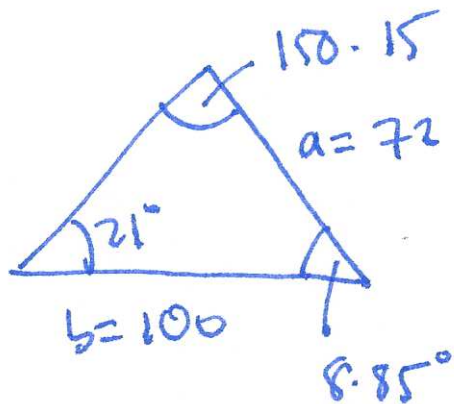
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

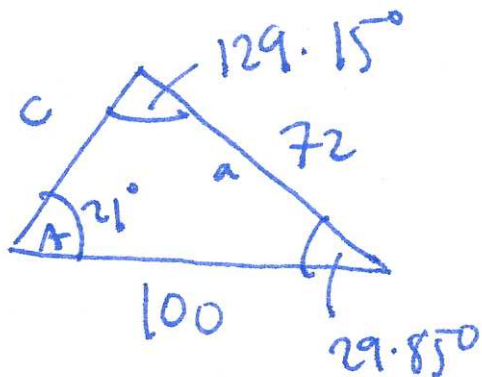
$$\frac{\sin(21^\circ)}{72} = \frac{\sin B}{100}$$

$$\sin B = \frac{100 \times \sin(21^\circ)}{72} = 0.4977$$

$$B = 29.85^\circ$$

$$180 - 29.85 = 150.15$$

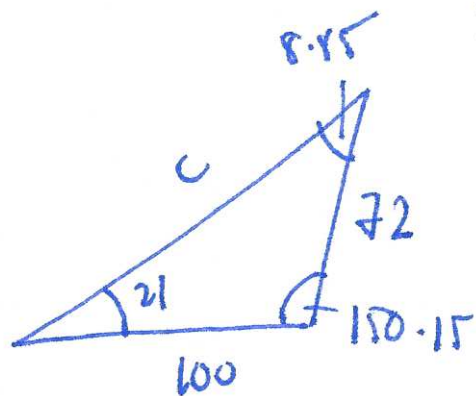




$$\frac{\sin C}{c} = \frac{\sin A}{a}$$

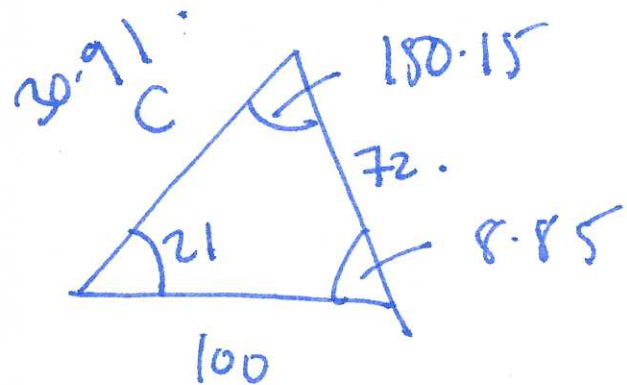
$$\frac{\sin(29.85)}{c} = \frac{\sin 21}{72}$$

$$c = \frac{72 \times \sin(29.85)}{\sin(21)} \approx 106$$



$$\frac{\sin 150.15}{c} = \frac{\sin 21}{72}$$

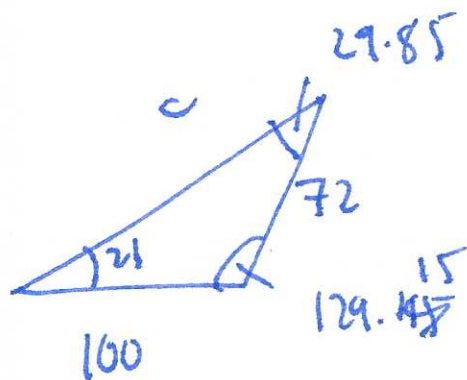
$$c = \frac{72 \cdot \sin 150.15}{\sin 21}$$



$$\frac{\sin C}{c} = \frac{\sin A}{a}$$

$$\frac{\sin 8.85}{c} = \frac{\sin 21}{72}$$

$$c = \frac{72 \times \sin(8.85)}{\sin(21)} \approx 30.91$$



$$\frac{\sin 129.15}{c} = \frac{\sin A}{a} = \frac{\sin 21}{72}$$

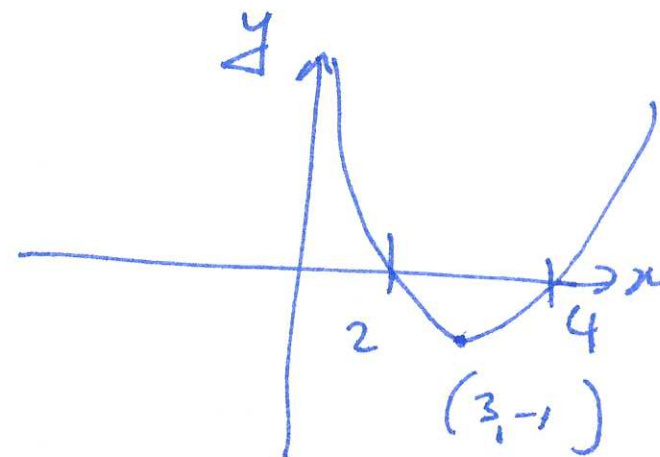
$$c = \frac{72 \times \sin(129.15)}{\sin(21)} \approx 155.81$$

Q7

$$x^2 - 6x + 8$$

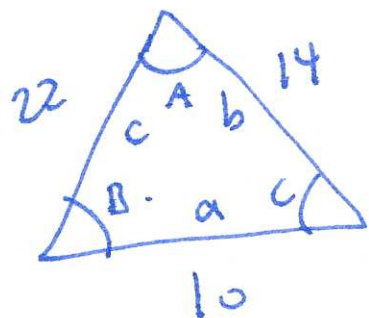
$$(x-3)^2 - 1$$

$$x^2 - 6x + 9 - 1$$



23

$$a = 10 \quad b = 14 \quad c = 22.$$



~~$$a^2 + b^2 = c^2 - 2ab \cos C.$$~~

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

$$b^2 = a^2 + c^2 - 2ac \cos B.$$

$$c^2 = a^2 + b^2 - 2ab \cos C.$$

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

$$A = 19.69^\circ.$$

$$\cos B = \frac{b^2 - a^2 - c^2}{-2ac}$$

$$B = 28.14^\circ.$$

$$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}.$$

$$C = 25.84^\circ.$$

I made a mistake in typing the numbers
in to the calculator : I did

$$\cos \left((22 \times 2) - 10 \times 10 - 14 \times 14 \right) / (-2 \times 10 \times 14)$$

should be 22

$$\cos \left((22 \times 22 - 10 \times 10 - 14 \times 14) / (-2 \times 10 \times 14) \right)$$

gives correct answer

$$C = 132.18^\circ$$