

Start here for

Question Number:

6

$$b. a) \quad f(x) = (x+2)(x^2+4)$$

$$i) \quad f(x) = x^3 + 4x + 2x^2 + 8$$

$$f'(x) = 3x^2 + 2(2x) + 4$$

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

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

$$\left[ \begin{array}{l} ac = 12 \\ b = 4 \end{array} \right]$$

cannot factorise.

$\therefore$   ~~$f$~~   $y = f(x)$  has no stationary points.

$$ii) \quad f''(x) = 3(2x) + 4$$

$$= 6x + 4$$

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

$$= 3x + 2$$

$$3x + 2 > 0$$

$$3x > -2$$

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

$$3x + 2 < 0$$

$$3x < -2$$

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

$\therefore$  graph is concave up for  
 $x < -\frac{2}{3}$

graph is concave down for  
 $x > -\frac{2}{3}$

(iii)  $y = (x+2)(x^2+4)$   
 $= x^3 + 4x + 2x^2 + 8$

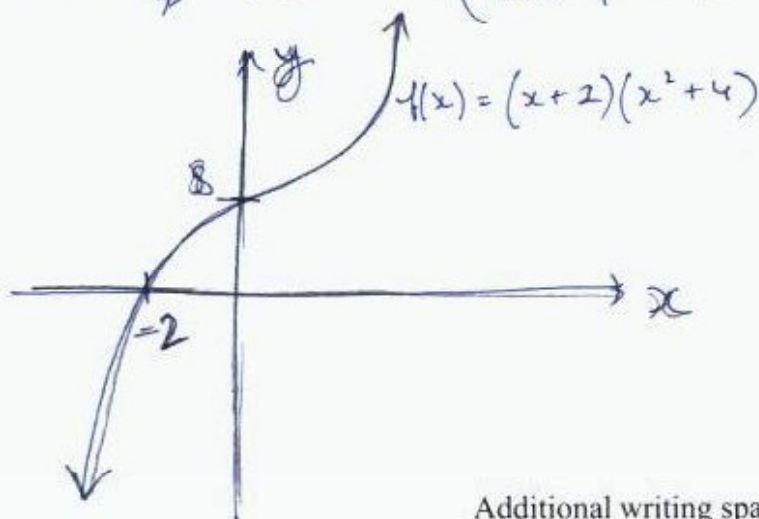
~~$0 = x^3 + 4x + 2x^2 + 8$~~   
 $\therefore$  no  $x$ -cuts.

$y = (0)^3 + 4(0) + 2(0)^2 + 8$   
 $= 8$

$\therefore$   $y$ -cut = 8

$x$ -cuts:

$x = -2$   ~~$x = \pm \sqrt{-4}$~~  ( $x \neq \sqrt{-4}$ )



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$$b) \textcircled{i} \ell = r\theta$$

$$9 = 5\theta$$

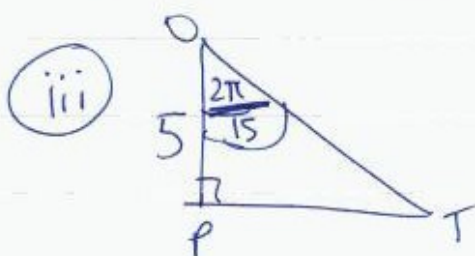
$$\theta = \frac{9}{5} = \frac{48\pi}{180} = \frac{4\pi}{15}$$

$\textcircled{ii}$  OT bisects  $\angle POQ$   
 $\therefore \angle POT = \angle QOT$  (because equal angles and common length  $\checkmark$ )

$$\angle TPO = \angle TQO$$

common length OT

$$\text{AAS} \Rightarrow \triangle OPT \cong \triangle OQT$$



$$\tan \frac{2\pi}{15} = \frac{\text{opp}}{\text{adj}}$$

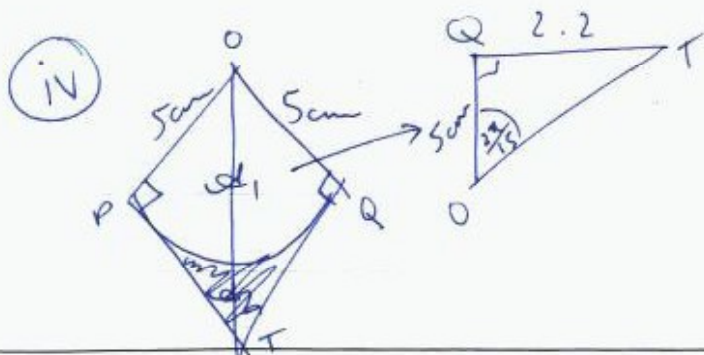
$$= \frac{PT}{5}$$

$$\therefore PT = 5 \tan \frac{2\pi}{15}$$

$$= 2.226 \dots$$

$$= \underline{2.23} \text{ (2 dp)}$$

$$= 2.2 \text{ cm (1 dp)}$$



$$A = \frac{bh}{2}$$

$$= \frac{2.2 \times 5}{2}$$

$$= 5.5$$



Start here.

$$5.5 \times 2 = 11$$

$\therefore$  area of the 2 triangles is  $11\text{cm}^2$   
( $= A_2$ )

$$A_1 = \frac{1}{2} r^2 \theta$$

$$= \frac{1}{2} (5^2) \frac{2\pi}{15}$$

$$= \frac{25^5}{2} \times \frac{2\pi}{15^3}$$

$$= \frac{5\pi}{3}$$

$\therefore$  area of sector is

$$\frac{5\pi}{3} \text{cm}^2$$

$$\rightarrow \text{shaded area} = A_2 - A_1$$

$$= 11 - \frac{5\pi}{3}$$

$$= 5.76 \text{cm}^2$$

(2 dp)