Start here for Question Number: 6

Q6.

a)(i) $f(x) = (x+2)(x^2+4)$

$= x^3 + 4x + 2x^2 + 8$

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

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

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

$= \frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times 4}}{2 \times 3}$

$= \frac{-4 \pm \sqrt{\cancel{64}}}{6}$

$= \frac{-4 \pm \cancel{\sqrt{}}\, 8}{6}$

$\therefore = \frac{-4+8}{6} = \frac{2}{3}$ and $\frac{-4-8}{6} = -2$

$\therefore x = \frac{2}{3}, -2.$

Sub $x = \frac{2}{3}$ into original

$f(x) = (\frac{2}{3})^3 + 4(\frac{2}{3}) + 2(\frac{2}{3})^2 + 8.$

$= (\frac{2}{3}, 11\frac{23}{27})$

Sub in $x = -2$ into original

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

$= 32.$

$\therefore (-2, 32)$

$x^3 + 2x^2 + 4x + 8 = 0$

$x(x^2 + 2x + 4) + 8 = 0$

$\therefore x = -8,$

$2 \times 2 = 4$

$4 \times 1 = 4$

$S = 2$

$P = 4$

$F =$

(ii) For concave ~~down~~ up when $y' \, \cancel{<} > 0$ as a ~~maximum exists~~ minimum exists.

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

Sub in $x = \frac{2}{3}$

$f'(x) = 3(\frac{2}{3})^2 + 4(\frac{2}{3}) + 4$

$= 8\frac{11}{12}$

$\therefore f'(x) > 0$ $\therefore$ minimum exists at $(\frac{2}{3}, 11\frac{23}{27})$

For concave down when $y' < 0$ as a maximum exists.

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

Sub in $x = -2$

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

$= 8$

$\therefore f'(x) > 0$ a minimum exists $\therefore$ is concave up not concave down.

at $(-2, 32)$

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(ii)

You may ask for an extra Writing Booklet if you need more space to answer question 6.

Start here.

b).

(i) $l = r\theta$

$9 = 5\theta$

$\therefore \theta = \frac{9}{5} \times \frac{\pi}{180}$ $\frac{180}{\cancel{\pi}}$ $\frac{\pi}{180}$

$= \frac{9\pi}{900}$

$\angle POQ = \frac{\pi}{100}$

(ii) ~~OT~~

ΔOPT is congruent to ΔOQT

As : • OT (shared between ΔOPT and ΔOQT) • $\angle OPT = \angle OQT = 90°$ (given)

• $OP = OQ = 5cm$ (given)

• $QT = PT$ (~~sides of~~ 2 equal sides of a Rhombus).

$\therefore \Delta OPT$ is congruent to ΔOQT

(iii)

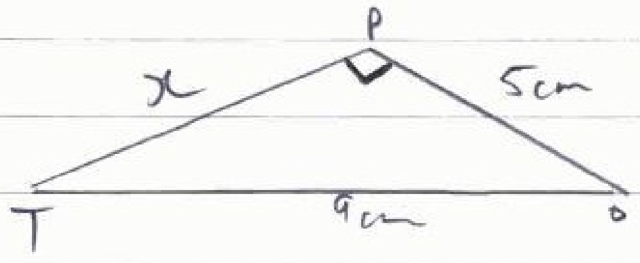
$a^2 = b^2 + c^2$

~~$x^2 = 5^2 +$~~

$9^2 = x^2 + 5^2$

$9^2 - 5^2 = x^2$

$56 = x^2$



$\therefore x = \pm 7.48331...$

$= \pm 7.5$ (1dp) cm

or

$x = \sqrt{56}$ cm

(iv) $A = \frac{1}{2}r^2\theta$

$= \frac{1}{2} \times 5^2 \times \frac{\pi}{100}$

$= \frac{12.5\pi}{100}$

$= \frac{\pi}{8} \times \frac{180}{\pi}$

$= \frac{\cancel{\pi}180}{8\cancel{\pi}}$

$= 22.5$

$\therefore A = 22.5\text{cm}^2$

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