Start here for Question Number: 6

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

i) No Stationary points when $f'(x) \neq 0$

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

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

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

$x = \dfrac{-4 \pm \sqrt{16 - 4(4)(3)}}{6}$

$16 - 4(4)(3) < 0$ ∴ No Solution

∴ No stationary points.

ii) Concavity when $f''(x) < 0$ or > 0

a < 0 ∩ down a > 0 ∪ up

$f''(x) = 6x + 4$

$6x + 4 > 0$

$6x > -4$

$x > -\dfrac{4}{6}$ $x > -\dfrac{2}{3}$

$f''(x) = 6x + 4$

$6x + 4 < 0$

$6x < -4$

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

$f(x)$ is concave up when $x > -\frac{2}{3}$

$f(x)$ is concave down when $x < -\frac{2}{3}$

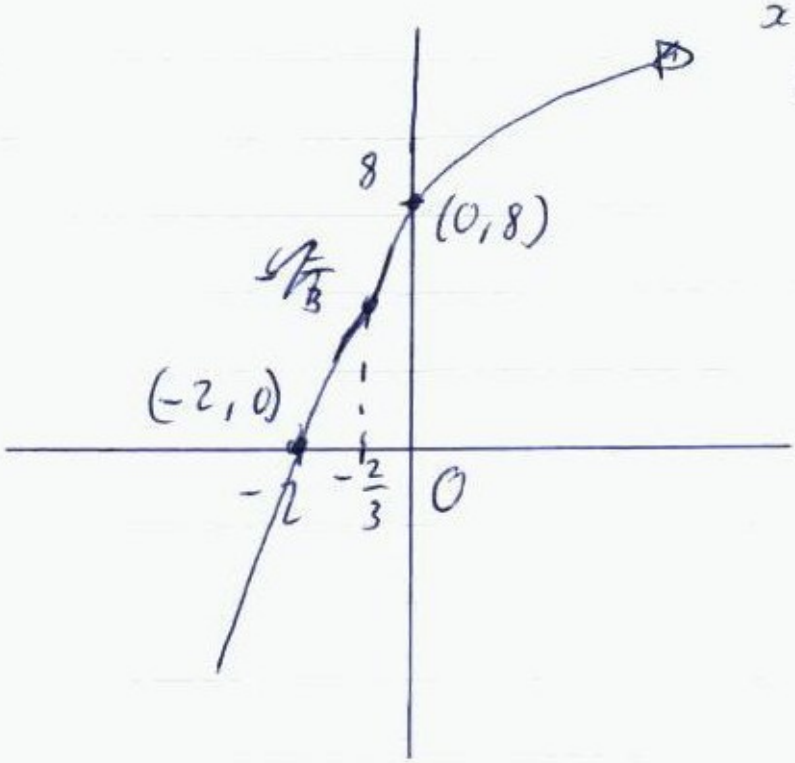
iii) $x = -2$

P.O.I at $f''(x) = 0$

$6x + 4 = 0$

$x = -\frac{4}{6}$

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



b) $9 = 5\theta$

i) $\angle POQ \times r = l$

$\angle POQ \times 5 = 9$

$\angle POQ = \frac{9}{5}$ radians

ii) OT is common (given)

OP = OQ (radius of a circle)

$\angle OPT = \angle OQT$ (given - perpendicular)

$\therefore \triangle OPT \equiv \triangle OQT$

iii)

T

Additional writing space on back page.

Office Use Only - Do NOT write anything, or make any marks below this line.

iii) $\Delta OPT \equiv \Delta OQT$

$\therefore \angle POT = \angle QOT$

$\therefore \angle POT = \left(\frac{9}{5}\right) \div 2$

$\angle POT = \frac{9}{10}$

$\angle OTP = \frac{\pi}{2} - \frac{9}{10}$

$\therefore \frac{PT}{\sin\frac{9}{10}} = \frac{5}{\sin\left(\frac{\pi}{2} - \frac{9}{10}\right)}$

$PT = \frac{5\sin\frac{9}{10}}{\cos\frac{9}{10}}$ $\quad PT = 6.3\text{cm}$

iv) Area of $\Delta OPT = \frac{1}{2} \times OP \times PT \times \sin 90$

$= \frac{1}{2} \times 5 \times 6.3$

Area of ΔQQT = Area of ΔOPT

$\therefore$ Area of $PQRT = 2 \times \frac{1}{2} \times 5 \times 6.3$

$= 5 \times 6.3 = 31.5\text{cm}^2$

Area shaded = Area of $OPTQ$ − Area of OPQ

Area$_{opq} = \frac{1}{2} \times 5^2 \times \frac{9}{10} = \frac{45}{4}$ radians $\therefore$ Area$_{shaded} = 31.5 + \frac{45}{4}$

$= 42.75\text{cm}^2$

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