Qn 1

a) $f(x) = (x-3)^2(x^2+6)^5$

Let $u = (x-3)$

and $v = (x^2+6)$

$f(x) = u^2 v^5$

$\frac{dy}{du} = 2uv^5 + 5u^2v^4$ (Chain rule)

$= 2(x-3)(x^2+6)^5 + 5(x-3)^2(x^2+6)^4$

$= (x-3)(x^2+6)^4(2(x^2+6)+5(x-3))$

b) ~~f(x)~~

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

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

$f(x) = x+1$

$f'(x) = (1)x^{1-1}$

$= 1$

Qn 3

$f(x) = \frac{8}{3+x}$

Let $(3+x) = u$

$f(u) = \frac{8}{u}$

$f'(u) = 8 \ln u$

$= 8 \ln(3+x)$

at point $(1, 2)$

Gradient $= 8 \ln(4)$

$= 11.09$

y Intercept

$y = \frac{8}{3} =$

~~Function~~

Equation

$y = 11.09x + 2.35$

Qn 3

$f(4) = 5$, $f'(4) = 3$

$f'(7) = 9$,

$g(4) = 12$, $g'(4) = 6$

$f'(4) + c = 3$
$f'(7) + c = 9$

$\Rightarrow 4a + c = 3$
$7a + c = 9$

$-3a = -6$

$a = 2$

$c = -5$

$f'(x) = 2x - 5$

$f(x) = x^2 - 5x + c$

$f(4) \Rightarrow 5 = (4)^2 - 5(4) + c$

$c = 9$

$f(x) = x^2 - 5x + 9$

$(fg)'(4) = f'(4) \cdot g'(4)$

$= 3 \times 6$

$= 18$

Qn 4

$\text{Tangent} = \frac{dy}{dx} = 6x$

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

$x = 1$

At $x = 1$ $\quad y = 3(1)^2 = 3$

$\frac{dy}{dx} = \frac{6}{1} = \frac{y-3}{x-1}$

$y - 3 = 6x - 6$

$y = 6x - 3$

$b = -3$

Qn 5

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

$$\frac{dy}{dx} = -3x^2 + 6x$$

Horizontal

$$-3x^2 + 6x = 0$$

$$x(-3x + 6) = 0$$

$$x = 0$$

or $-3x = -6$

$$x = 2$$

When $x = 0$

$$y = -2$$

or

When $x = 2$

$$y = -(2)^3 + 3(2)^2 - 2$$

$$= 2$$

$x + 4 = 3$

$x + 7 = 9$

$f(4)$

$4x + c = 3$

$7x + c = 9$

$3x = 6$

$x = 2$

$2x + 5 =$

Qsn. 6

$$C(x) = -0.004x^2 + 5.2x + 2500$$

$$C'(x) = -0.008x + 5.2$$

$$R'(x) = 218 - 0.36x$$

Profit $P(x) = 218x - 0.18x^2 + 0.004x^2 - 5.2x - 2500$

$$= 212.8x - 0.176x^2 - 2500$$

Marginal Profit $= P'(x)$.

$$P'(x) = 212.8 - 0.352x$$

$$P(150) = 212.8 - 0.352(150)$$

$$= \underline{160}$$