

DIFFERENTIATION SOLUTIONS

1a) $y = 6x^3$
 $\therefore y' = 18x^2$

b) $y = \frac{2}{x}$
 $= 2x^{-1}$
 $\therefore y' = -2x^{-2}$

c) $y = e^x x^2$
 $u = e^x \quad v = x^2$
 $u' = e^x \quad v' = 2x$

$\therefore y' = uv' + u'v$
 $= e^x 2x + e^x x^2$
 $(= e^x x(2+x))$

d) $y = (2x+1)(x^2-6)$
 $u = 2x+1 \quad v = x^2-6$
 $u' = 2 \quad v' = 2x$

$\therefore y' = (2x+1)2x + 2(x^2-6)$
 $= 4x^2 + 2x + 2x^2 - 12$
 $= 6x^2 + 2x - 12$

e) $y = \frac{x^2}{3x-2}$
 $u = x^2 \quad v = 3x-2$
 $u' = 2x \quad v' = 3$

$\therefore y' = \frac{2x(3x-2) - x^2 \times 3}{(3x-2)^2}$
 $= \frac{6x^2 - 4x - 3x^2}{(3x-2)^2}$
 $= \frac{3x^2 - 4x}{(3x-2)^2}$

f) $y = 5 \quad \therefore y' = 0$

g) $y = 2 \ln x \quad \therefore y' = \frac{2}{x}$

h) $y = \frac{3}{x} - \frac{5}{x^2}$
 $= 3x^{-1} - 5x^{-2}$

$\therefore y' = -3x^{-2} + 10x^{-3}$

i) $y = (2x^3)^5$
 $= 2^5 (x^3)^5$
 $= 2^5 x^{15}$

or $u = 2x^3$
 $\therefore u' = 6x^2$
 $u^5 \rightarrow 5u^4$

$\therefore y' = 15 \times 2^5 x^{14}$
 $\therefore y' = 6x^2 \times 5x(2x^3)^4$
 $= 30x^2 (2x^3)^4$

j) $y = (e^{2x})^3$
 $= e^{6x}$
 $\therefore y' = 6e^{6x}$

or $u = e^{2x}$
 $\therefore u' = 2e^{2x}$
 $u^3 \rightarrow 3u^2$
 $\therefore y' = 2e^{2x} \times 3(e^{2x})^2$
 $= 6e^{2x} \times (e^{2x})^2$

2. a) $y = x^2 + 4x + 6$
 $y' = 2x + 4$
 $y'' = 2$

b) $y = 2x^3 - 3x^2 + 7x - 4$
 $y' = 6x^2 - 6x + 7$
 $y'' = 12x - 6$

c) $y = \ln x$
 $y' = \frac{1}{x} = x^{-1}$
 $y'' = -x^{-2}$

GRAPHS

- | | | | |
|--------|---------|--------|----------|
| (i) E | (iii) C | (v) T | (vii) P |
| (ii) J | (iv) G | (vi) L | (viii) K |