Homework 1

d) $\int \frac{3}{2x+1} dx = \frac{3}{2}\ln(2x+1) + c$

e) $\int \frac{-5}{6-10x} dx = \frac{1}{2}\ln(6-10x) + c$

f) $\int 3(4x+1)^{-3} dx = \frac{3(4x+1)^{-2}}{-2 \times 4}$

$= -\frac{3}{8(4x+1)^2}$

g) $\int \frac{(x+2)^2}{2x} dx = \int \frac{x^2+4x+4}{2x} dx$

$= \int \frac{x}{2} + 2 + \frac{2}{x} dx$

$= \frac{x^2}{4} + 2x + 2\ln(x) + c$

Q3)

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

$\int (x+4)^3 dx = \frac{(x+4)^4}{4} + c$

$f(-2) = 5$

$5 = \frac{(-2+4)^4}{4} + c$

$= \frac{2^4}{4} + c$

$= 4 + c$

$5 = 4 + c$

$c = 1$

$$f(x) = \frac{(x+4)^4}{4} + 1$$

3)

b) $f'(x) = 8(1-2x)^{-5}$

$$f(x) = \frac{8(1-2x)^{-4}}{-4 \times -2} + c$$

$$= \frac{8}{8(1-2x)^4} + c$$

$$= \frac{1}{(1-2x)^4} + c$$

$f(1) = 3$

$$3 = \frac{1}{(1-2)^4} + c$$

$$= \frac{1}{1} + c$$

$$= 1 + c$$

$c = 2$

$$f(x) = \frac{1}{(1-2x)^4} + 2$$

Q15)

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

b) $\int \frac{10}{(2x+3)} dx = 5\ln(2x+3) + c$

$f'(1) = 2$

$$2 = \frac{k}{2+3}$$

$$= \frac{k}{5}$$

a) $k = 10$

Q15)

Coordinates of point where $y = \ln x$ is parallel to $(1, e)$ in $y = e^x$

$f(x)$

$y = e^x$

$\frac{dy}{dx} = e^x$

$x = 1$

$f'(1) = e^1$

$= e$

$g(x)$

$y = \ln(x)$

$y' = \frac{1}{x}$

$g'(x) = e$ if parallel

$e = \frac{1}{x}$

$x = \frac{1}{e}$

$\therefore g(\frac{1}{e})$ gradient is parallel

$g(\frac{1}{e}) = \ln(\frac{1}{e})$

$= \ln(e^{-1})$

$= -1\ln(e)$

$= -1$

$(\frac{1}{e}, -1)$

Q9) $y = e^{2x} \times \ln(3x)$

$u = e^{2x}$ $\quad v = \ln(3x)$

$u' = 2e^{2x}$ $\quad v' = \frac{1}{x}$

$$\frac{dy}{dx} = \frac{e^{2x}}{x} + 2e^{2x}\ln(3x)$$

$$= e^{2x}\left(\frac{1}{x} + 2\ln(3x)\right)$$

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