PERFAIT AKAKA SHISOKA

17G01ACS059

CALCULUS 2 THIRD ASSIGNMENT

a)$\int (3x - 4)^7 dx$

$$let\ u = (3x - 4) \therefore \frac{du}{dx} = 3$$

$$\frac{dx}{du} = \frac{1}{3}$$

$$\int u^7 . \frac{du}{3} = \frac{1}{3} \int u^7 du$$

$$= \frac{1}{3} (u)^7 \times du$$

$$= \frac{1}{3} \left(\frac{u^8}{8} \right) + c$$

$$= \frac{1}{24} u^8 + c$$

$$= \frac{1}{24} (3x - 4)^8 + c$$

b) $\int 3x^2 (x^3 + 1) dx$

$$let\ u = x^3 + 1 \therefore \frac{du}{dx} = 3x^2$$

$$dx * \frac{du}{dx} = 3x^2 * dx$$

$$\approx dx = \frac{du}{3x^2}$$

$$\int 3x^2 (x^3 + 1) . \frac{1}{3x^2}$$

$$\int 3x^2 (x^2 + 1) \therefore = \frac{1}{2} \int u^2 . du$$

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

c) $\int \frac{2x}{1+x^2} dx$

$$let\ u = 1 + x^2$$

$$\frac{du}{dx} = 2x$$

$$dx * \frac{du}{dx} = 2x * dx$$

$$du = 2x$$

$$dx = \frac{du}{2x}$$

$$= \int \frac{2x}{u} * \frac{du}{2x}$$

$$= \int \frac{du}{u} dx$$

$$= \int \frac{1}{u}$$

$$= ln|u| + c$$

$$= ln|1 + x^2| + c$$

d) $\int \ln \frac{3x}{x} dx$

$$let\ u = ln(3x)$$

$$\frac{du}{dx} = \frac{1}{3x}$$

$$dx = 3x du$$

$$\int \frac{du}{dx} = \frac{1}{x} = \int \frac{u}{x} * (3x du)$$

$$= \int \frac{u}{x} * 3x du$$

$$u du = \frac{u^2}{2}$$

$$= ln \frac{(3x)^2}{2} + c$$

$$= \frac{3}{2} ln\ 3x^2 + c$$

e) $\int xe^{2x}$

$$let\ u = 2x = \frac{du}{dx} = 2$$

$$\frac{du}{2} = \frac{2}{2}dx$$

$$dx = \frac{du}{2}$$

$$\int xe^{2x} = x * \frac{1}{2}e^{2x} - \int \frac{1}{2}e^{2x} * dx$$

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

f) $\int_0^5 5x\sqrt{(x^2 + 3)}$

$$let\ u = x^2 + 3 = \frac{du}{dx} = 2x$$

$$dx * \frac{du}{dx} = 2x * dx,\ so\ dx = \frac{du}{2x}$$

$$\int_0^5 5x\left(u^{\frac{1}{2}}\right) * \frac{du}{2x}$$

$$= \frac{5}{2}\int_0^5 u^{\left(\frac{1}{2}+1\right)}du$$

$$= \frac{5}{2}\int_0^5 \left(\frac{u^{\frac{3}{2}}}{\frac{3}{2}}\right) + c$$

$$= \frac{5}{2}\left(\frac{(x^2+3)^{\frac{3}{2}}}{\frac{3}{2}}\right) + c$$

$$= \left[\frac{5}{3}(5^2 + 3)^{\frac{3}{2}}\right]_0^5$$

$$= \left[\frac{5}{3}(5^2 + 3)^{\frac{3}{2}}\right] - \left[\frac{5}{3}(0^2 + 3)^{\frac{3}{2}}\right]$$

$$= \frac{280}{3}\sqrt{7} - 5\sqrt{3}$$

$$= 238.28^2$$