SOLUTIONS
IN CLASS ASSIGNMENT #10
APRIL 18th 2012
NYA CALCULUS FOR
ELECTRONICS ENGINEERING

(1) $$\int 4x^3 - x\,dx = \frac{4x^4}{4} - \frac{x^2}{2} + C = \boxed{x^4 - \tfrac{1}{2}x^2 + C}$$

(2) $$\int \sqrt{x}\,(x^2+8)\,dx = \int x^{1/2}(x^2+8)\,dx$$
$$= \int x^{5/2} + 8x^{1/2}\,dx$$
$$= \frac{x^{7/2}}{7/2} + 8\frac{x^{3/2}}{3/2} + C$$
$$= \boxed{\frac{2}{7}x^{7/2} + \frac{16}{3}x^{3/2} + C}$$

(3) $$\int_0^2 x(4-x)\,dx = \int_0^2 4x - x^2\,dx$$
$$= \frac{4x^2}{2} - \frac{x^3}{3}\Big|_0^2$$
$$= 2x^2 - \frac{1}{3}x^3\Big|_0^2 = 8 - 8/3 = \boxed{16/3}$$

(4) $\int 5+\frac{6}{x^3}\,dx = 5x + \frac{6x^{-2}}{-2} + C$

$= \boxed{5x - \frac{3}{x^2} + C}$

(5) $\int e^{-8x}\,dx$

$u = -8x$

$du = -8\,dx$

$-\frac{1}{8}\,du = dx$

$= \int e^{u}\left(\frac{-1}{8}\right)du$

$= \frac{-1}{8}e^{u} + C$

$= \boxed{-\frac{1}{8}e^{-8x} + c}$

(6) $\int \frac{1}{x[\ln 2x]^2}\,dx$

$u = \ln(2x)$

$du = \frac{1}{2x}\cdot 2\,dx$

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

$x\,du = dx$

$= \int \frac{1}{x\,u^2}\,x\,du$

$= \int \frac{1}{u^2}\,du$

$= \frac{u^{-1}}{-1} + C$

$= \boxed{-\frac{1}{\ln(2x)} + c}$

7.
$$\int \frac{4\cos\theta}{1+\sin\theta}\,d\theta \qquad \begin{aligned} u &= 1+\sin\theta \\ du &= \cos\theta\,d\theta \end{aligned}$$

$$= \int \frac{4}{u}\,du$$

$$= 4\ln|u| + C$$

$$= \boxed{4\ln|1+\sin\theta| + C}$$

8.
$$\int \frac{4-e^{\sqrt{x}}}{\sqrt{x}\,e^{\sqrt{x}}}\,dx \qquad \begin{aligned} u &= \sqrt{x} \\ du &= \frac{1}{2\sqrt{x}}\,dx \end{aligned}$$

$$= \int \left(\frac{4-e^{u}}{e^{u}}\right)2\,du \qquad 2\,du = \frac{1}{\sqrt{x}}\,dx$$

$$= \int \left(\frac{4}{e^{u}} - 1\right)2\,du$$

$$= \int 8e^{-u} - 2\,du$$

$$= -8e^{-u} - 2u + C$$

$$= -8e^{-\sqrt{x}} - 2\sqrt{x} + C$$

$$= \boxed{\frac{-8}{e^{\sqrt{x}}} - 2\sqrt{x} + C}$$

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$$\int_1^e \frac{3\cos(\ln x)}{x}\,dx$$

$u = \ln x$

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

$x\,du = dx$

$x = 1 \quad u = \ln(1) = 0$

$x = e \quad u = \ln(e) = 1$

$$= \int_0^1 \frac{3\cos u}{\cancel{x}}\,\cancel{x}\,du$$

$$= \int_0^1 3\cos u\,du$$

$$= 3\sin u \Big|_0^1 = 3\sin 1 - 3\sin 0$$

$$= \boxed{3\sin(1)}$$

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$$\int_{-2}^{5} \frac{1}{\sqrt[3]{x^2+6x+9}}\,dx$$

$$= \int_{-2}^{5} \frac{1}{(x+3)^{2/3}}\,dx$$

$$= \int_{-2}^{5} (x+3)^{-2/3}\,dx$$

$$= \frac{(x+3)^{1/3}}{1/3} \Bigg|_{-2}^{5}$$

$$= 3(x+3)^{1/3} \Bigg|_{-2}^{5}$$

$$= 3(5+3)^{1/3} - 3(-2+3)^{1/3}$$

$$= 3(2) - 3(1)$$

$$= \boxed{3}$$