REVIEW FOR TEST 3
OPTIONAL ASSIGNMENT
NYA ELECTROTECH

P. 758

#1 $\int 4x^3 - x\,dx$

$= \boxed{x^4 - \frac{x^2}{2} + C}$

#3 $\int \sqrt{u}\,(u^2+8)\,du$

$= \int u^{5/2} + 8u^{1/2}\,du$

$= \frac{2}{7}u^{7/2} + 8\left(\frac{2}{3}u^{3/2}\right) + C$

$= \boxed{2/7\, u^{7/2} + 16/3\, u^{3/2} + C}$

#5 $\int_1^4 \frac{\sqrt{x}}{2} + \frac{2}{\sqrt{x}}\,dx$

$= \int_1^4 \frac{1}{2}x^{1/2} + 2x^{-1/2}\,dx$

$= \frac{1}{3}x^{3/2} + 4x^{1/2} \Big|_1^4$

$= (8/3 + 8) - (1/3 + 4)$

$= 7/3 + 4 \approx 6.333$

$= \boxed{19/3}$

#7 $\int_0^2 x(4-x)\,dx$

$= \int_0^2 4x - x^2\,dx$

$= 2x^2 - \frac{x^3}{3} \Big|_0^2$

$= (8 - 8/3) - (0)$

$= \boxed{16/3}$

#9 $\int 5 + \frac{6}{x^3}\,dx$

$= \int 5 + 6x^{-3}\,dx$

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

#11 $\int_{-2}^{5} \frac{dx}{\sqrt[3]{x^2+6x+9}}$

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

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

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

$= \left(3(8)^{1/3}\right) - \left(3(1)^{1/3}\right)$

$= 6 - 3 = \boxed{3}$

#25 $f(-1) = 3$

$f'(x) = 3 - x^2$

so $f(x) = \int 3 - x^2\,dx$

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

$3 = 3(-1) - \frac{(-1)^3}{3} + C$

$3 = -3 + 1/3 + C$

$C = 17/3$ $\quad \boxed{f(x) = 3x - \frac{x^3}{3} + \frac{17}{3}}$

P. 873

#1 $\int e^{-8x}\,dx$

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

#3 $\int \frac{dx}{x(\ln 2x)^2}$

$u = \ln 2x$

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

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

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

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

$= \boxed{-(\ln 2x)^{-1} + C}$

#5 $\int_0^{\pi/2} \frac{4\cos\theta}{1+\sin\theta}\,d\theta$

$u = 1+\sin\theta$

$du = \cos\theta\,d\theta$

$\theta = \pi/2 \quad u = 1+\sin\pi/2 = 2$

$\theta = 0 \quad u = 1+\sin 0 = 1$

$\int_1^2 \frac{4}{u}\,du$

$= 4\ln|u|\Big|_1^2$

$= \boxed{4\ln 2}$

#6 $\int \frac{\sec^2 x}{2+\tan x}\,dx$

$u = 2+\tan x$

$du = \sec^2 x\,dx$

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

$= \ln|u| + C$

$= \boxed{\ln|2+\tan x| + C}$

#11 $\int_0^2 \frac{x}{4+x^2}\,dx$

$u = x^2+4$

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

$x = 2 \quad u = 8$

$x = 0 \quad u = 4$

$\int_4^8 \frac{1}{2u}\,du = \frac{1}{2}\ln|u|\Big|_4^8$

$= \frac{1}{2}(\ln 8 - \ln 4)$

$= \frac{1}{2}\ln(8/4)$

$= \boxed{\frac{1}{2}\ln 2}$

#15 $\int \frac{e^x}{1+e^{2x}}\,dx = \int \frac{e^x}{1+(e^x)^2}\,dx$

$u = e^x$

$du = e^x\,dx$

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

$= \arctan u + C$

$= \boxed{\arctan e^x + C}$

#20 $$\int \frac{4-e^{\sqrt{x}}}{\sqrt{x}\, e^{\sqrt{x}}}\, dx$$

$u = \sqrt{x}$

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

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

$$= 2\int \frac{4-e^{u}}{e^{u}}\, du$$

$$= 2\int 4e^{-u} - 1\, du$$

$$= 2\left(-4e^{-u} - u\right) + C$$

$$= 2\left(-4e^{-\sqrt{x}} - \sqrt{x}\right) + C$$

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

#37 $$\int_1^e \frac{3\cos(\ln x)}{x}\, dx$$

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

$du = \frac{1}{x}\, dx$ $\quad x = 1 \quad u = 0$

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

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

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

#41 $$\int \frac{\sin x \cos^2 x}{5 + \cos^2 x}\, dx$$

$u = \cos x$

$du = \sin x\, dx$

$$\int \frac{u^2}{5+u^2}\, du$$

Long divide

$$\begin{array}{r|l} & 1 \\ \hline 5+u^2 & u^2 \\ & -(u^2+5) \\ \hline & -5 \end{array}$$

$$1 - \frac{5}{5+u^2}$$

$$= 1 - \frac{1}{1+u^2/5}$$

$$= \int 1 - \frac{1}{1+u^2/5}\, du$$

$$= u - \arctan(u/\sqrt{5}) + C$$

$$= \boxed{\cos x - \arctan(\cos x/\sqrt{5}) + C}$$