

REVIEW FOR TEST 3
OPTIONAL ASSIGNMENT
NYA ELECTROTECH

(1)

P. 758

$$\begin{aligned} \# 1 \quad & \int 4x^3 - x \, dx \\ &= \boxed{x^4 - \frac{x^2}{2} + C} \end{aligned}$$

$$\begin{aligned} \# 3 \quad & \int \sqrt{u}(u^2+8) \, du \\ &= \int u^{5/2} + 8u^{1/2} \, du \\ &= \frac{2}{7}u^{7/2} + 8\left(\frac{2}{3}u^{3/2}\right) + C \\ &= \boxed{\frac{2}{7}u^{7/2} + \frac{16}{3}u^{3/2} + C} \end{aligned}$$

$$\begin{aligned} \# 5 \quad & \int_1^4 \frac{\sqrt{x}}{2} + \frac{2}{\sqrt{x}} \, dx \\ &= \int_1^4 \frac{1}{2}x^{1/2} + 2x^{-1/2} \, dx \\ &= \frac{1}{3}x^{3/2} + 4x^{1/2} \Big|_1^4 \\ &= \left(\frac{8}{3} + 8\right) - \left(\frac{1}{3} + 4\right) \\ &= \frac{7}{3} + 4 \approx 6.333 \\ &= \boxed{\frac{19}{3}} \end{aligned}$$

$$\begin{aligned} \# 7 \quad & \int_0^2 x(4-x) \, dx \\ &= \int_0^2 4x - x^2 \, dx \\ &= 2x^2 - \frac{x^3}{3} \Big|_0^2 \\ &= \left(8 - \frac{8}{3}\right) - (0) \\ &= \boxed{\frac{16}{3}} \end{aligned}$$

$$\begin{aligned} \# 9 \quad & \int 5 + \frac{6}{x^3} \, dx \\ &= \int 5 + 6x^{-3} \, dx \\ &= \boxed{5x + -3x^{-2} + C} \end{aligned}$$

$$\begin{aligned} \# 11 \quad & \int_{-2}^5 \frac{dx}{\sqrt[3]{x^2+6x+9}} \\ &= \int_{-2}^5 \frac{dx}{(x+3)^{2/3}} \\ &= \int_{-2}^5 (x+3)^{-2/3} \, dx \\ &= 3(x+3)^{1/3} \Big|_{-2}^5 \\ &= \left(3(8)^{1/3}\right) - \left(3(1)^{1/3}\right) \\ &= 6 - 3 = \boxed{3} \end{aligned}$$

$$\# 25 \quad f(-1) = 3$$

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

$$\begin{aligned} \text{so } f(x) &= \int 3 - x^2 \, dx \\ &= 3x - \frac{x^3}{3} + C \end{aligned}$$

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

$$3 = -3 + \frac{1}{3} + C$$

$$C = \frac{17}{3}$$

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

p. 873

$$\begin{aligned} \#1 \int e^{-8x} dx \\ = \boxed{-\frac{1}{8}e^{-8x} + C} \end{aligned}$$

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

$$\begin{aligned} u &= \ln 2x \\ du &= \frac{1}{x} \cdot 2 dx \\ &= \frac{2 dx}{x} \end{aligned}$$

$$\begin{aligned} &= \int \frac{1}{u^2} du \\ &= \int u^{-2} du \\ &= \frac{u^{-1}}{-1} + C \\ &= \boxed{-\frac{1}{\ln 2x} + C} \end{aligned}$$

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

$$\begin{aligned} u &= 1 + \sin \theta \\ du &= \cos \theta d\theta \end{aligned}$$

$$\begin{aligned} \theta = \pi/2 \quad u &= 1 + \sin \pi/2 = 2 \\ \theta = 0 \quad u &= 1 + \sin 0 = 1 \end{aligned}$$

$$\begin{aligned} &\int_1^2 \frac{4}{u} du \\ &= 4 \ln |u| \Big|_1^2 \\ &= \boxed{4 \ln 2} \end{aligned}$$

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

$$\begin{aligned} u &= 2 + \tan x \\ du &= \sec^2 x dx \end{aligned}$$

$$\begin{aligned} &= \int \frac{1}{u} du \\ &= \ln |u| + C \\ &= \boxed{\ln |2 + \tan x| + C} \end{aligned}$$

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

$$\begin{aligned} u &= x^2 + 4 \\ du &= 2x dx \quad \frac{1}{2} du = x dx \end{aligned}$$

$$\begin{aligned} x=2 \quad u &= 8 \\ x=0 \quad u &= 4 \end{aligned}$$

$$\begin{aligned} \int_4^8 \frac{1}{2u} du &= \frac{1}{2} \ln |u| \Big|_4^8 \\ &= \frac{1}{2} (\ln 8 - \ln 4) \\ &= \frac{1}{2} \ln \left(\frac{8}{4}\right) \\ &= \boxed{\frac{1}{2} \ln 2} \end{aligned}$$

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

$$\begin{aligned} u &= e^x \\ du &= e^x dx \end{aligned}$$

$$\begin{aligned} &= \int \frac{1}{1+u^2} du \\ &= \arctan u + C \\ &= \boxed{\arctan e^x + C} \end{aligned}$$

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

$$\begin{aligned}
 u &= \sqrt{x} \\
 du &= \frac{1}{2\sqrt{x}} dx &= 2 \int \frac{4 - e^u}{e^u} du \\
 2du &= \frac{1}{\sqrt{x}} dx &= 2 \int 4e^{-u} - 1 du \\
 & &= 2(-4e^{-u} - u) + C \\
 & &= 2(-4e^{-\sqrt{x}} - \sqrt{x}) + C \\
 & &= \boxed{\frac{-8}{e^{\sqrt{x}}} - 2\sqrt{x} + C}
 \end{aligned}$$

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

$$\begin{aligned}
 u &= \ln x & x &= e & u &= 1 \\
 du &= \frac{1}{x} dx & x &= 1 & u &= 0
 \end{aligned}$$

$$\begin{aligned}
 &\int_0^1 3 \cos u \, du \\
 &= 3 \sin u \Big|_0^1 \\
 &= \boxed{3 \sin 1}
 \end{aligned}$$

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

$$\begin{aligned}
 u &= \cos x \\
 du &= -\sin x \, dx
 \end{aligned}$$

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

Long divide

$$\begin{aligned}
 \frac{5 + u^2}{5 + u^2} &= \frac{1}{1 + \frac{u^2}{5}} \\
 &= 1 - \frac{5}{5 + u^2} \\
 &= 1 - \frac{1}{1 + \frac{u^2}{5}}
 \end{aligned}$$

$$\begin{aligned}
 &= \int 1 - \frac{1}{1 + \frac{u^2}{5}} du \\
 &= u - \text{Arctan}\left(\frac{u}{\sqrt{5}}\right) + C \\
 &= \boxed{\cos x - \text{Arctan}\left(\frac{\cos x}{\sqrt{5}}\right) + C}
 \end{aligned}$$

