Review Sheet Answer Key

(1) $\int \cos x \, dx$

$\sin x + C$

(2) $\int_1^4 x^3 + 4x^2 \, dx$

$\frac{x^4}{4} + \frac{4x^3}{3} \Big|_1^4$

@4 − @1

$\left(\frac{(4)^4}{4} + \frac{4(4)^3}{3}\right) - \left(\frac{(1)^4}{4} + \frac{4(1)^3}{3}\right)$

$\left(64 + \frac{256}{3}\right) - \left(\frac{19}{12}\right)$

$\left(\frac{192}{3} + \frac{256}{3}\right) - \left(\frac{19}{12}\right)$

$\left(\frac{448}{3}\right) - \left(\frac{19}{12}\right)$

$\frac{1792}{12} - \frac{19}{12} = \frac{1773}{12}$ or $= 147.7$

(3)

$$\int \frac{1}{(1+4x)^5}\,dx$$

let $u = 1+4x$

$du = 4\,dx$

$dx = \frac{du}{4}$

$$\int \frac{1}{u^5}\,\frac{du}{4}$$

$$\frac{1}{4}\int \frac{1}{u^5}\,du$$

$$\frac{1}{4}\int u^{-5}\,du$$

$$\frac{1}{4}\,\frac{u^{-4}}{4}.$$

$$\frac{1}{16}(1+4x)^{-4}+C \quad \text{or} \quad \frac{1}{16(1+4x)^4}+C$$

(4) $\int \frac{x}{(4x^2+1)^3}\,dx$

let $u = 4x^2 + 1$

$du = 8x\,dx$

$dx = \frac{du}{8x}$

$\int \frac{\cancel{x}}{u^3} \frac{du}{\cancel{8x}}$

$\frac{1}{8}\int \frac{1}{u^3}\,du$

$\frac{1}{8}\int u^{-3}\,du$

$\frac{1}{8}\,\frac{u^{-2}}{-2}$

$-\frac{1}{16}\,u^{-2}$

$-\frac{1}{16}(4x^2+1)^{-2} + C$ or $= \frac{-1}{(4x^2+1)^2} + C$

(7)

$$\int x^2 \sec^2(x^3)\, dx$$

let $u = x^3$

$du = 3x^2\, dx$

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

$$\int x^2 \cdot \sec^2(u)\, \frac{du}{3x^2}$$

$$\frac{1}{3}\int \sec^2 u\, du$$

$$\frac{1}{3}\tan u$$

$$\frac{1}{3}\tan(x^3) + C$$

(8) $\int_5^7 2x\sqrt{7+4x^2}\,dx$

let $u = 7+4x^2$

$du = 8x\,dx$

$dx = \frac{du}{8x}$

$\int_5^7 2x\sqrt{u}\,\frac{du}{8x}$

$\frac{2}{8}\int \sqrt{u}\,du$

$\frac{1}{4}\int \sqrt{u}\,du$

$\frac{1}{4}\int u^{1/2}\,du$

$\frac{1}{4}\cdot\frac{u^{3/2}}{\frac{3}{2}}$

$\frac{1}{4}\cdot\frac{2}{3}u^{3/2}$

$\frac{2}{12}u^{3/2}$

$\frac{1}{6}u^{3/2}$

$\frac{1}{6}(7+4x^2)^{3/2}\Big|_5^7$

@7 − @5

$\frac{1}{6}\left[(7+4(7)^2)^{3/2} - (7+4(5)^2)^{3/2}\right]$

$\frac{1}{6}\left[(203)^{3/2} - (107)^{3/2}\right]$

$\frac{1}{6}\left[2892 - 1106.8\right]$

$\frac{1}{6}\left[1785.2\right]$

297.5

(5) $\int_0^{\pi/2} \sin x \, dx$

$-\cos x \Big|_0^{\frac{\pi}{2}}$

$@\frac{\pi}{2} \quad - \quad @\,0$

$\left(-\cos \frac{\pi}{2}\right) - \left(-\cos 0\right)$

$-0 \quad - \quad (-1)$

(1)

(6) $\int x \cos(3x^2)\, dx$

let $u = 3x^2$

$du = 6x \, dx$

$dx = \frac{du}{6x}$

$\int x \cdot \cos u \cdot \frac{du}{6x}$

$\frac{1}{6} \int \cos u \, du$

$\frac{1}{6} \sin u$

$\frac{1}{6} \sin(3x^2) + C$