p. 394/2, 3, 5-12 Skip 2d

(2) a) $\int_{-1}^{4} (5-2x)^8 \, dx \; (-2)$ $\quad u = 5-2x$, $du = -2dx$

$$-\frac{1}{2}\int_{7}^{-3} u^8 \, du$$

b) $\int_{-\frac{\pi}{3}}^{2\pi/3} \frac{\sin x}{\sqrt{2+\cos x}} \, dx \; (-1)$ $\quad u = 2+\cos x$, $du = -\sin x \, dx$

$u = 2+\cos\left(-\frac{\pi}{3}\right)$, $u = 2+\frac{1}{2} = \frac{5}{2}$

$u = 2+\cos\left(\frac{2\pi}{3}\right)$, $u = 2+-\frac{1}{2} = \frac{3}{2}$

$$-1\int_{\frac{5}{2}}^{3/2} \frac{du}{u^{1/2}}$$

c) $\int_{0}^{\pi/4} \tan^2 x \sec^2 x \, dx$ $\quad u = \tan x$, $du = \sec^2 x \, dx$

$u = \tan 0 = 0$, $u = \tan\frac{\pi}{4} = 1$

$$\int_{0}^{1} u^2 \, du$$

~~2d) $\int_0^{\sqrt{3}} x^3\sqrt{x^2+3}\,dx$ $\quad u = x^2+3$, $du = 2x\,dx$~~

SKIP (2d)

3a) $\frac{1}{2}\int_{0}^{1} e^{2x-1} \, dx \; (2)$ $\quad u = 2x-1$, $du = 2dx$

$$\frac{1}{2}\int_{-1}^{1} e^u \, du$$

3b) $\int_{e}^{e^2} \frac{\ln x}{x} \, dx$ $\quad u = \ln x$, $du = \frac{1}{x}dx$

$$= \int_{e}^{e^2} \underbrace{\ln x}_{u} \cdot \underbrace{\frac{1}{x}dx}_{du}$$

$$= \int_{1}^{2} u \, du$$

Use only Method 2

(5) $\frac{1}{2}\int_0^1 (2x+1)^3\,dx$ (2) $u = 2x+1$, $du = 2dx$

$\frac{1}{2}\int_1^3 u^3\,du = \frac{1}{2}\left[\frac{u^4}{4}\right]_1^3 = \frac{1}{2}\left[\frac{81}{4} - \frac{1}{4}\right] = \frac{1}{2}[20] = \boxed{10}$

(6) $\frac{1}{4}\int_1^2 (4x-2)^3\,dx$ (4) $u = 4x-2$, $du = 4dx$

$\frac{1}{4}\int_2^6 u^3\,du = \frac{1}{4}\left[\frac{u^4}{4}\right]_2^6 = \frac{1}{4}\left[\frac{1296}{4} - \frac{16}{4}\right] = \frac{1}{4}[320] = \boxed{80}$

(7) $\frac{1}{2}\int_0^1 (2x-1)^3\,dx$ (2) $u = 2x-1$, $du = 2dx$

$\frac{1}{2}\int_{-1}^1 u^3\,du = \frac{1}{2}\left[\frac{u^4}{4}\right]_{-1}^1 = \frac{1}{2}\left[\frac{1}{4} - \frac{1}{4}\right] = \boxed{0}$

(8) $-\frac{1}{3}\int_1^2 (4-3x)^8\,dx$ (-3) $u = 4-3x$, $du = -3dx$

$-\frac{1}{3}\int_1^{-2} u^8\,du = -\frac{1}{3}\left[\frac{u^9}{9}\right]_1^{-2} = -\frac{1}{3}\left[\frac{-512}{9} - \frac{1}{9}\right] = -\frac{1}{3}[-57] = \boxed{19}$

(9) $\int_0^8 x\sqrt{1+x}\,dx$

$u-1 = x$

$u = 1+x$

$du = dx$

$\int_1^9 (u-1)u^{1/2}\,du = \int_1^9 (u^{3/2}-u^{1/2})\,du = \left[\frac{2}{5}u^{5/2} - \frac{2u^{3/2}}{3}\right]_1^9$

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

$\left(\frac{486}{5} - \frac{54}{3}\right) - \left(\frac{2}{5} - \frac{2}{3}\right)$

$\frac{484}{5} - \frac{52}{3} = \frac{1452-260}{15} = \boxed{\frac{1192}{15}}$

(10) $-1\int_{-3}^{0} x\sqrt{1-x}\,dx(-1)$

$1-u = x$

$u = 1-x$

$du = -dx$

$-1\int_4^1 (1-u)u^{1/2}\,du = \int_1^4 (u^{1/2}-u^{3/2})\,du = \left[\frac{2}{3}u^{\frac{3}{2}} - \frac{2u^{5/2}}{5}\right]_1^4$

$= \left(\frac{2}{3}(2)^3 - \frac{2}{5}(2)^5\right) - \left(\frac{2}{3} - \frac{2}{5}\right)$

$\frac{16}{3} - \frac{64}{5} - \frac{2}{3} + \frac{2}{5} = \frac{14}{3} - \frac{62}{5} = \frac{70-186}{15}$

$= \boxed{\frac{-116}{15}}$

(11) $\int_0^{\pi/2} 4\sin(x/2)\,dx = 2\int_0^{\pi/2} 4\sin\left(\frac{1}{2}x\right)dx\left(\frac{1}{2}\right)$ $u=\frac{1}{2}x$ $du=\frac{1}{2}dx$

$$8\int_0^{\pi/4}\sin u\,du = 8\left[-\cos u\right]_0^{\pi/4} = 8\left[-\cos\frac{\pi}{4} - -\cos 0\right]$$

$$= 8\left[-\frac{\sqrt{2}}{2}+1\right] = \boxed{-4\sqrt{2}+8}$$

S
C
-S
-C
S

(12) $\frac{1}{3}\cdot 2\int_0^{\pi/6}\cos 3x\,dx(3)$ $u=3x$ $du=3dx$

$$\frac{2}{3}\int_0^{\pi/2}\cos u\,du = \frac{2}{3}\left[\sin u\right]_0^{\pi/2} = \frac{2}{3}\left[\sin\frac{\pi}{2}-\sin 0\right]$$

$$= \frac{2}{3}(1-0) = \boxed{\frac{2}{3}}$$