DAY 112 Ch 7 p. 360 #49-56, *71, *72

(49) $\int \pi t^3 + 4t\,dt$

$= \boxed{\frac{\pi}{4}t^4 + 2t + C}$

(50) $\int \sin 3x\,dx$

$\boxed{-\frac{1}{3}\cos 3x + C}$

$u = 3x$
$du = 3\,dx$
$\frac{1}{3}du = dx$
$\frac{1}{3}\int \sin u\,du$

(51) $\int 2x\cos(x^2)\,dx$

$\boxed{\sin(x^2) + C}$

$u = x^2$
$du = 2x\,dx$
$\int \cos u\,du$

(52) $\int 12t^2\cos(t^3)\,dt$

$\boxed{-4\sin(t^3) + C}$

$u = t^3$
$du = 3t^2\,dt$
$4du = 12t^2\,dt$
$4\int \cos u\,du$

(53) $\int \sin(2-5x)\,dx$

$\boxed{\frac{1}{5}\cos(2-5x) + C}$

$u = 2-5x$
$du = -5\,dx$
$-\frac{1}{5}du = dx$
$-\frac{1}{5}\int \sin u\,du$

(54) $\int e^{\sin x}\cos x\,dx$

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

$u = \sin x$
$du = \cos x\,dx$
$\int e^u\,du$

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

$= \boxed{\frac{1}{2}\ln|x^2+1| + C}$

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

(56) $\frac{1}{3}\int \frac{dx}{\cos^2(2x)}$

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

$= \boxed{\frac{1}{6}\tan(2x) + C}$

$u = 2x$
$du = 2\,dx$
$\frac{1}{2}du = dx$
$\frac{1}{6}\int \sec^2 u\,du$

(*) (71) $\int y\sqrt{y+1}\,dy$

$u = y+1 \longrightarrow y = u-1$
$du = 1\,dy$

$= \int (u-1)\sqrt{u}\,du$
$= \int u^{3/2} - u^{1/2}\,du$
$= \frac{2}{5}u^{5/2} - \frac{2}{3}u^{3/2} + C$
$= \boxed{\frac{2}{5}(y+1)^{5/2} - \frac{2}{3}(y+1)^{3/2} + C}$

(*) (72) $\int z\,(z+1)^{1/3}\,dz$

$u = z+1 \rightarrow u-1 = z$
$du = dz$

$= \int (u-1)(u)^{1/3}\,du$
$= \int u^{4/3} - u^{1/3}\,du$
$= \frac{3}{7}u^{7/3} - \frac{3}{4}u^{4/3} + C$
$= \boxed{\frac{3}{7}(z+1)^{7/3} - \frac{3}{4}(z+1)^{4/3} + C}$