8.2.24

$$\int \underbrace{\ln 2x}_{u} \cdot \underbrace{x^{-2}\,dx}_{dv} = I$$

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

$v = \int x^{-2}\,dx = -x^{-1}$

$$I = -x^{-1}\ln 2x - \int -x^{-1}x^{-1}\,dx$$

$\int x^{-2}\,dx = -x^{-1}$

$$I = -x^{-1}\ln 2x - x^{-1} + C = \frac{-\ln 2x - 1}{x} + C$$

$$\int \arcsin x\,dx$$

$u = \arcsin x \qquad du = (1-x^2)^{-1/2}\,dx$

$dv = dx, \quad v = x$

$$= x \arcsin x - \int x(1-x^2)^{-1/2}\,dx$$

$u_2 = 1-x^2$

$du_2 = -2x\,dx$

$-\frac{1}{2}\,du_2 = x\,dx$

$$\int u^{-1/2}\left(-\tfrac{1}{2}\right)du_2$$

$$-\tfrac{1}{2} \cdot 2\,u^{1/2} = -u^{1/2} = -\sqrt{1-x^2}$$

$$\int \arcsin x\,dx = x \arcsin x + \sqrt{1-x^2} + C$$

$$\int e^x \cos x \, dx = I$$

$u_1 = \cos x \quad du_1 = -\sin x \, dx$

$dv = e^x dx \,, \quad v = e^x$

$$I = e^x \cos x + \int e^x \sin x \, dx$$

$u_2 = \sin x \quad du_2 = \cos x dx$

$dv = e^x dx \,, \quad v = e^x$

$$I = e^x \cos x + e^x \sin x - \underbrace{\int e^x \cos x \, dx}_{I}$$

$$2I = e^x (\cos x + \sin x)$$

$$\int e^x \cos x \, dx = \frac{e^x}{2} (\cos x + \sin x) + C$$

<u>8.2.65</u> $\int \sin \sqrt{x} \, dx$

$z = \sqrt{x} \,, \quad dz = \frac{1}{2} x^{-1/2} dx$

$dx = 2\sqrt{x} \, dz = 2z \, dz$

$$= \int \overbrace{\sin z}^{dv} \cdot \underbrace{2z}_{u} \overbrace{dz}$$

$u = 2z \,, \quad du = 2 \, dz$

$dv = \sin z \, dz \,, \quad v = -\cos z$

$$= -2z\cos z - \int -\cos z \cdot 2 \, dz \Big]$$

$2 \int \cos z \, dz$

$= 2 \sin z$

$$= -2z\cos z + 2\sin z + C$$

$$= -2\sqrt{x}\cos\sqrt{x} + 2\sin\sqrt{x} + C$$

<u>MC.22</u> $\int_0^1 f \cdot g' \, dx$

$u = f, \quad du = f' \, dx$

$dv = g' \, dx, \quad v = g$

$$\int f g' \, dx = f \cdot g - \int f' \cdot g \, dx$$

$$\int_0^1 f g' \, dx = f \cdot g \Big|_0^1 - \underbrace{\int_0^1 f' g \, dx}_{5}$$

$$= f(1) g(1) - f(0) \cdot g(0) - 5$$