8.1   # 3, 6, 12, 18, 40

8.1 #3

$$\int (4x-12)e^{-8x}\,dx$$

$u = 4x-12 \qquad du = 4\,dx$

$dv = e^{-8x}\,dx \qquad v = -\frac{1}{8}e^{-8x}$

$$= (4x-12)\cdot -\frac{1}{8}e^{-8x} - \int -\frac{1}{8}e^{-8x}\cdot 4\,dx$$

$$= -\frac{1}{8}(4x-12)e^{-8x} + \frac{1}{2}\int e^{-8x}\,dx$$

$$= -\frac{1}{8}(4x-12)e^{-8x} + \frac{1}{2}\cdot\frac{1}{-8}e^{-8x} + C.$$

8.1 #6

$$\int_0^3 \frac{3-x}{3e^x}\,dx = \int_0^3 (3-x)\cdot\frac{1}{3}e^{-x}\,dx$$

$u = 3-x \qquad du = -dx$

$dv = \frac{1}{3}e^{-x}\,dx \qquad v = -\frac{1}{3}e^{-x}$

$$= (3-x)\cdot -\frac{1}{3}e^{-x} - \int -\frac{1}{3}e^{-x}\cdot -dx$$

$$= (3-x)\cdot -\frac{1}{3}e^{-x} - \frac{1}{3}\int e^{-x}\,dx = (3-x)\cdot -\frac{1}{3}e^{-x} + \frac{1}{3}e^{-x}\Big|_0^3$$

$$= (3-3)\cdot -\frac{1}{3}e^{-3} + \frac{1}{3}e^{-3} - \left((3-0)\cdot -\frac{1}{3}e^{-0} + \frac{1}{3}e^{-0} \right)$$

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

$$= +\frac{1}{3}e^{-3} + \frac{2}{3}$$

8.1 #12

$$\int_0^1 xe^x\,dx$$

$u = x \qquad du = dx$

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

$$= xe^x - \int e^x\,dx = xe^x - e^x\Big|_0^1$$

$$= 1e^1 - e^1 - (0e^0 - e^0)$$

$$= 0 - (0-1) = 1$$

8.1 #18

$$\int x^3 e^{x^4} dx$$

u-sub: $u = x^4$

$du = 4x^3 dx$

$\frac{1}{4} du = x^3 dx$

$$= \int e^u \cdot \frac{1}{4} du = \frac{1}{4} \int e^u du = \frac{1}{4} e^u + C$$

$$= \frac{1}{4} e^{x^4} + C .$$

8.1 #40

$$\int_1^6 2x^2 e^{-x} dx$$

$u = 2x^2 \quad du = 4x dx$

$dv = e^{-x} dx \quad v = -e^{-x}$

$$= 2x^2 \cdot (-e^{-x}) - \int -e^{-x} \cdot 4x dx$$

$$= -2x^2 e^{-x} + 4 \int x e^{-x} dx$$

$u = x \quad du = dx$

$dv = e^{-x} dx \quad v = -e^{-x} dx$

$$= -2x^2 e^{-x} + 4 \left(x \cdot (-e^{-x}) - \int -e^{-x} dx \right)$$

$$= -2x^2 e^{-x} + 4 \left(-x e^{-x} + \int e^{-x} dx \right)$$

$$= -2x^2 e^{-x} + 4 \left(-x e^{-x} - e^{-x} \right) \Big|_1^6$$

$$= -2 \cdot 6^2 e^{-6} + 4 \left(-6 e^{-6} - e^{-6} \right) - \left(-2 e^{-1} + 4 \left(-e^{-1} - e^{-1} \right) \right)$$

$$\approx 3.43$$