Math 122   HW #7

Section 8.1   #3, #13
Section   8.2   #8, #11, #29

8.1 #3

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

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

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

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

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

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

8.1 #13

$$\int x^2 e^{2x}\, dx$$

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

$dv = e^{2x}\, dx$ $v = \frac{1}{2} e^{2x}$

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

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

$u = x$ $du = dx$

$dv = e^{2x}\, dx$ $v = \frac{1}{2} e^{2x}$

$$= \frac{1}{2} x^2 e^{2x} - \left(x \cdot \frac{1}{2} e^{2x} - \int \frac{1}{2} e^{2x}\, dx \right)$$

$$= \frac{1}{2} x^2 e^{2x} - \left(\frac{1}{2} x e^{2x} - \frac{1}{2} \cdot \frac{1}{2} e^{2x} \right) + C$$

8.2 #8

$$\pi \int_1^3 (\sqrt{x+5})^2 \, dx \quad = \pi \int_1^3 x+5 \, dx$$

$$= \pi \left(\frac{x^2}{2} + 5x \right) \Big|_1^3 = \pi \left(\frac{3^2}{2} + 3 \cdot 5 \right) - \pi \left(\frac{1^2}{2} + 5 \right)$$

8.2 #11

$$\int_0^2 \pi (e^x)^2 \, dx = \pi \int_0^2 e^{2x} \, dx = \pi \cdot \frac{1}{2} e^{2x} \Big|_0^2$$

$$= \pi \cdot \frac{1}{2} e^{2 \cdot 2} - \pi \cdot \frac{1}{2} e^{2 \cdot 0} = \frac{\pi}{2} e^4 - \frac{\pi}{2}$$

8.2 #29

Avg value of $e^{x/7}$ on $[0,7]$

$$\frac{1}{7-0} \int_0^7 e^{x/7} \, dx = \frac{1}{7} \int_0^7 e^{\frac{1}{7}x} \, dx = \frac{1}{7} \cdot \frac{1}{\frac{1}{7}} e^{\frac{1}{7}x} \Big|_0^7$$

$$= e^{\frac{1}{7} \cdot 7} - e^{\frac{1}{7} \cdot 0} = e^1 - e^0 = e - 1.$$