

February 21, 2007

### Extra Problems

#### Problem #1

$$\int 2x e^x dx$$

$$u = 2x \quad dv = e^x dx$$

$$du = 2 dx \quad v = e^x$$

$$\int u dv = uv - \int v du$$

$$\int 2x e^x dx = 2xe^x - \int e^x 2 dx = 2xe^x - 2 \int e^x dx = 2xe^x - 2e^x + C$$

#### Problem #4

$$\int 3x(5x-2)^{-3} dx$$

$$u = 3x \quad dv = (5x-2)^{-3} dx$$

$$du = 3 dx \quad v = -\frac{1}{10}(5x-2)^{-2}$$

$$\int 3x(5x-2)^{-3} dx = 3x \left[ -\frac{1}{10}(5x-2)^{-2} \right] - \int 3 \left[ -\frac{1}{10}(5x-2)^{-2} \right] dx$$

$$= -\frac{3}{10}x(5x-2)^{-2} + \frac{3}{10} \int (5x-2)^{-2} dx$$

$$= -\frac{3}{10}x(5x-2)^{-2} + \frac{3}{10} \left[ \frac{1}{5}(-1)(5x-2)^{-1} \right] + C$$

$$= -\frac{3}{10}x(5x-2)^{-2} - \frac{3}{50}(5x-2)^{-1} + C$$

$$\int (5x-2)^{-3} dx = \frac{1}{5} \int u^{-3} du = \frac{1}{5} \left( \frac{1}{-2} \right) u^{-2} + C = -\frac{1}{10}(5x-2)^{-2} + C$$

$$u = 5x-2$$

$$du = 5 dx$$

$$\frac{1}{5} du = dx$$

#### Problem #7

$$\int x^2 e^x dx$$

$$u = x^2 \quad dv = e^x dx$$

$$du = 2x dx \quad v = e^x$$

$$\int x^2 e^x dx = x^2 e^x - 2 \int x e^x dx$$

$$u = x \quad dv = e^x dx$$

$$du = dx \quad v = e^x$$

$$x^2 e^x - 2 \int x e^x dx = x^2 e^x - 2 \left[ x e^x - \int e^x dx \right] = x^2 e^x - 2x e^x + 2 \int e^x dx$$

$$= x^2 e^x - 2x e^x + 2e^x + C$$

Problem #8

$$\int_0^2 x(2x+5)^{1/2} dx$$

$$u = x \quad dv = (2x+5)^{1/2} dx$$

$$du = dx \quad v = \frac{1}{3}(2x+5)^{3/2}$$

$$\int_0^2 x(2x+5)^{1/2} dx = \left[ \frac{1}{3} x(2x+5)^{3/2} \right]_0^2 - \int_0^2 \frac{1}{3} (2x+5)^{3/2} dx$$

$$= \left[ \frac{1}{3} x(2x+5)^{3/2} \right]_0^2 - \frac{1}{3} \left[ \frac{1}{2} \left( \frac{2}{5} \right) (2x+5)^{5/2} \right]_0^2$$

$$= \left[ \frac{1}{3} (2)(2(2)+5)^{3/2} - \left[ \frac{1}{3} 0(2(0)+5)^{3/2} \right] \right] - \frac{1}{15} \left[ (2(2)+5)^{5/2} - (2(0)+5)^{5/2} \right]$$

$$= \frac{2}{3} (9)^{3/2} - 0 - \frac{1}{15} (9)^{5/2} - \frac{1}{15} (5)^{5/2}$$

$$= \frac{2}{3} (27) - \frac{1}{15} (243) - \frac{1}{15} (\sqrt{5})^5 = \dots$$

$$\int (2x+5)^{1/2} dx = \frac{1}{2} \int u^{1/2} du = \frac{1}{2} \left( \frac{2}{3} \right) u^{3/2} + C = \dots$$

$$u = 2x+5$$

$$du = 2 dx$$

$$\frac{1}{2} du = dx$$