Math 1172 HW # 5

Section 6.8 # 47

Section 7.1 # 7/11 , 51/57

Section 7.2 # 4

6.8 #47

$$\lim_{x\to\infty} x^3 e^{-x^2} = \lim_{x\to\infty} \frac{x^3}{e^{x^2}} \qquad \frac{\infty}{\infty}$$

$$= \lim_{x\to\infty} \frac{3x^2}{e^{x^2}\cdot 2x} = \lim_{x\to\infty} \frac{3x}{2e^{x^2}} \qquad \frac{\infty}{\infty}$$

$$= \lim_{x\to\infty} \frac{3}{2e^{x^2}\cdot 2x} = 0 \quad \left(\text{this is } \frac{3}{\infty}\right)$$

7.1 #7/11

$$\int (x^2 + 2x)\cos x\,dx \qquad u = x^2+2x \quad du = 2x+2\,dx \qquad dv = \cos x\,dx \quad v = \sin x$$

$$= (x^2+2x)\sin x - \int \sin x \cdot (2x+2)\,dx \qquad u = 2x+2 \quad du = 2\,dx \qquad dv = \sin x\,dx \quad v = -\cos x$$

$$= (x^2+2x)\sin x - \left((2x+2)\cdot(-\cos x) - \int -\cos x \cdot 2\,dx \right)$$

$$= (x^2+2x)\sin x + (2x+2)\cos x - 2\int \cos x\,dx$$

$$= (x^2+2x)\sin x + (2x+2)\cos x - 2\sin x + C$$

7.1 #51/57

$$\int (\ln x)^n \, dx$$

$u = (\ln x)^n \qquad du = n(\ln x)^{n-1} \cdot \frac{1}{x} dx$

$dv = 1 \, dx \qquad v = x$

$$= (\ln x)^n \cdot x - \int x \cdot n(\ln x)^{n-1} \cdot \frac{1}{x} \, dx$$

$$= (\ln x)^n \cdot x - n \int (\ln x)^{n-1} \, dx$$

7.2 #4

$$\int_0^{\pi/2} \sin^5 x \, dx = \int_0^{\pi/2} \sin x \cdot \sin^4 x \, dx$$

$$= \int_0^{\pi/2} \sin x \left(1 - \cos^2 x\right)^2 dx$$

$u = \cos x$

$du = -\sin x \, dx$

$$= \int (1 - u^2)^2 \, du = -\int 1 - 2u^2 + u^4 \, du$$

$$= -\left(u - \frac{2}{3}u^3 + \frac{1}{5}u^5\right)\Bigg|_{x=0}^{x=\pi/2} = -\left(\cos x - \frac{2}{3}(\cos x)^3 + \frac{1}{5}(\cos x)^5\right)\Bigg|_0^{\pi/2}$$

$$= -\left(0 - \frac{2}{3} \cdot 0 + \frac{1}{5} \cdot 0\right) - -\left(1 - \frac{2}{3} \cdot 1 + \frac{1}{5} \cdot 1\right)$$