Math 122 HW #12

Section 12.7 #5, 8, 36

Section 13.3 #2, 9

12.7 #5

$$\lim_{x\to 2} \frac{\ln(x-1)}{x-2} \qquad \text{plug: } \frac{\ln(2-1)}{2-2} = \frac{\ln 1}{0} = \frac{0}{0}$$

$$\text{L'Hop: } = \lim_{x\to 2} \frac{\frac{1}{x-1}}{1} = \lim_{x\to 2} \frac{1}{x-1} = \frac{1}{2-1} = 1$$

12.7 #8

$$\lim_{x\to 0} \frac{e^{2x}-1}{5x^2-x} \qquad \text{plug: } \frac{e^0-1}{5\cdot 0^2-0} = \frac{1-1}{0} = \frac{0}{0}$$

$$\text{L'Hop: } = \lim_{x\to 0} \frac{2e^{2x}}{10x-1} = \frac{2e^0}{0-1} = \frac{2}{-1} = -2$$

12.7 #36

$$\lim_{x\to\infty} \frac{(\ln x)^2}{x} \qquad \text{plug: } \frac{(\ln\infty)^2}{\infty} = \frac{\infty^2}{\infty} = \frac{\infty}{\infty}$$

$$\text{L'Hop: } = \lim_{x\to\infty} \frac{2\ln x \cdot \frac{1}{x}}{1} = \lim_{x\to\infty} \frac{2\ln x}{x} \qquad \text{plug: } \frac{2\ln\infty}{\infty} = \frac{\infty}{\infty}$$

$$\text{L'Hop: } = \lim_{x\to\infty} \frac{2\cdot\frac{1}{x}}{1} = \lim_{x\to\infty} \frac{2}{x} = \frac{2}{\infty} = 0$$

13.3 #2

$$\int \sin 5x\,dx \qquad u = 5x \quad du = 5dx \quad \tfrac{1}{5}du = dx$$

$$= \int \frac{1}{5}\sin u\,du = \frac{1}{5}\int \sin u\,du = -\frac{1}{5}\cos u + C = -\frac{1}{5}\cos 5x + C$$

13.3 #9

$$\int \sin^7 x \cos x\,dx = \int (\sin x)^7 \cos x\,dx \qquad u = \sin x \quad du = \cos x\,dx$$

$$= \int u^7\,du = \frac{1}{8}u^8 + C = \frac{1}{8}(\sin x)^8 + C$$

$$= \frac{1}{8}\sin^8 x + C$$