M210T - Emerging Scholars Seminar
Practice for Exam 1
February 1, 2010

1. Determine the following limits:

$$\lim_{x\to 0}\left(\frac{1}{x}-\frac{1}{e^x-1}\right) \qquad \lim_{x\to 0^+}\ln x^{\sqrt{x}}$$

$$\lim_{x\to\infty}\left(\frac{2x-3}{2x+5}\right)^{2x+1} \qquad \lim_{x\to 0}\frac{2x+\sin^{-1}(x)}{2x-\tan^{-1}(x)}$$

$$\lim_{x\to 0}(\cos(x))^{\sin(x)}$$

2. Determine whether the following converge or diverge. If the integral converges, find its limit.

$$\int_0^5 \frac{2}{\sqrt{x}-2}\,dx \qquad \int_{-\infty}^{\infty}\frac{1}{1+x^2}\,dx$$

$$\int_0^{\infty}\ln|x-10|\,dx \qquad \int_0^{\pi}\sec x\,dx$$

3. Determine whether the following sequences converge or diverge. If it converges, find its limit.

$$a_n=\left(\frac{n}{n+1}\right)^{n/2} \qquad a_n=\frac{2^{n+1}}{3}$$

$$a_n=\frac{n\cos(n)}{n^2+3} \qquad a_n=(-1)^n\left(\sqrt{n^2+n}-\sqrt{n^2+1}\right)$$

4. Determine whether the following series converge or diverge. If it converges, find its limit.

$$\sum_{n=0}^{\infty}\frac{n}{\sqrt{1+n^2}} \qquad \sum_{n=0}^{\infty}\frac{1}{e^{3n+1}}$$

$$\sum_{n=1}^{\infty}\left(\frac{4}{7}\right)^{n+1} \qquad \sum_{n=0}^{\infty}[2(0.1)^n+3(0.2)^n]$$

$$\sum_{n=0}^{\infty}\frac{1}{n^2+3n+2}$$