Math 14 **Sample Gateway Exam 3** **100 Points**

All numbered problems are worth ten points except problem 9, which is worth 20 points. You must get at least 90 points to pass.

1. $\int (x+2)\sqrt{x^2+4x-3}\,dx =$

2. $\int \dfrac{1}{x^2\sqrt{x^2-4}}\,dx =$ Use $x = 2\sec\theta$.

3. $\int x\sin(3x)\,dx =$

4. $\displaystyle\int_0^\infty \frac{1}{e^x}\,dx =$

5. a) $\displaystyle\lim_{x\to 0} \frac{x^2}{1-\cos(2x)} =$ b) $\displaystyle\lim_{x\to\infty} \frac{\sin x}{x+\sin x} =$

6. $\displaystyle\sum_{k=2}^{\infty}(-1)^k\frac{2^{k+1}}{5^k} =$

7. Find the interval of convergence of $\displaystyle\sum_{k=2}^{\infty}\frac{(x+3)^k}{k-1}$ except for the endpoints.

8. Find the power series expansion about $x=0$ of the function $f(x) = \dfrac{e^x-1}{x}$.

9. For each of the following series state whether it

   A) converges absolutely, B) converges conditionally, or C) diverges.

   You do not need to justify your answers.

   a) $\displaystyle\sum_{k=0}^{\infty}\frac{2^k+5}{3^k}$ b) $\displaystyle\sum_{k=2}^{\infty}\frac{(-1)^k}{\ln k}$ c) $\displaystyle\sum_{k=1}^{\infty}\frac{(-1)^k}{k^2+\sin k}$ d) $\displaystyle\sum_{k=1}^{\infty}\frac{k^k}{k!}$