MATH143-01 Exam Three Spring 2009

You may keep this page of questions. Turn in your answers with all of your work on the green paper and the tan paper. You are NOT allowed to use your calculator on the first five questions. Answer these five questions on the green paper. When you have completed these five questions, turn in all of the green paper and receive tan paper to use on the last two questions. The last two questions are printed on the back of this page. You ARE allowed to use your calculator on the last two questions and you will need your calculator for some parts of the last two questions.

(1) 16 Points. Find the Maclaurin series for $f(x) = 1 - \cos(x^3)$. You are expected to use a known power series and to express your final answer using summation notation.

(2) 18 Points. Use the integral test either to **prove** that the series $\sum_{k=1}^{\infty} \frac{(\ln k)^2}{k}$ converges or else to **prove** that this series diverges.

(3) 20 Points. Find the interval of convergence, including endpoint behavior, for the power series $\sum_{k=1}^{\infty} \frac{(-1)^k (x-6)^k}{\sqrt{k}}$.

(4) 12 Points. The function $f(x)$ is approximated near $x = 5$ by the third degree Taylor polynomial $P_3(x) = -8 + 2(x-5) + 7(x-5)^2 - 10(x-5)^3$. Find the values of :

(a) $f(5)$ **(b)** $f'(5)$ **(c)** $f''(5)$ **(d)** $f'''(5)$

(5) 12 Points. Find exact values for:

(a) $\sum_{k=0}^{\infty} 5\left(\frac{2}{3}\right)^k$ **(b)** $\sum_{k=2}^{\infty} 5\left(\frac{2}{3}\right)^k$ **(c)** $\sum_{k=0}^{100} 5\left(\frac{2}{3}\right)^k$

You will need your calculator for **these** two questions. Turn in all of your work on the first five questions and any extra green paper. You will receive tan paper to use for these last two questions.

(6) 10 Points. Find the partial sums S_{200}, S_{400} and S_{800} for the series $\displaystyle\sum_{k=1}^{\infty} \frac{\sin(k^3)}{k}$. Based upon these calculations, do you expect that this series converges or that it diverges?

(7) 12 Points. If you save \$160.00 at the **beginning** of every year for 50 years and invest this money at 4.3% nominal annual interest compounded annually, how much money will you have at the end of 50 years? I have deliberately emphasized that for this question, you are saving at the beginning of every year rather than at the end of every year.