

M408D Practice Exam I
Wednesday September 20, 2006
50 minutes, 100 points

1. (10 pts.) Test this series for convergence or divergence:

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

2. (15 pts.) Determine whether the following integral is convergent or divergent, and if it is convergent, evaluate it:

$$\int_1^9 \frac{1}{\sqrt[3]{x-9}} dx$$

3. (10 pts.) Test this series for convergence or divergence:

$$\sum_{n=1}^{\infty} (\sqrt[3]{2} - 1)^n$$

4. (10 pts.) Test this series for convergence or divergence:

$$\sum_{n=1}^{\infty} \frac{1}{n - n \cos^2 n}$$

5. (15 pts.) Evaluate the following limit:

$$\lim_{x \rightarrow \infty} \left(\frac{x}{x+1} \right)^x$$

6. (10 pts.) Test the series for convergence or divergence:

$$\sum_{n=0}^{\infty} \frac{n!}{2 \cdot 5 \cdot 8 \cdots (3n+2)}$$

7. (10 pts.) Test this series for convergence or divergence:

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

8. (20 pts.) Determine whether this series is absolutely convergent, conditionally convergent, or divergent:

$$\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{n \ln n}$$