

Sample Exam 3
Math 31, Spring 2010

This exam had slightly different coverage; our exam may also include problems from 7.8 and 8.3. You should also expect at least one essay/explanation problem.

1. (10 points) Let $\{a_n\}$ be a sequence that starts $a_1 = \frac{1}{1}$, $a_2 = -\frac{7}{2}$, $a_3 = \frac{7^2}{6}$, $a_4 = -\frac{7^3}{24}$. Assuming the pattern continues, find a formula for a_n .

2. (10 points) Determine the value of $\lim_{n \rightarrow \infty} \frac{n \ln n}{n^3 + 2}$, if the limit exists; or if the limit does not exist, **explain** how you know the limit does not exist. Briefly **justify** your answer.

3. (14 points) Determine if the series

$$\sum_{n=0}^{\infty} \frac{13(2^n)}{5^n}$$

converges or diverges. If it converges, find its sum. Briefly **JUSTIFY** your answer.

4. (14 points) Use the integral test to determine if the series

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

converges or diverges. Briefly **JUSTIFY** your answer.

5. (13 points) Determine if the series

$$\sum_{n=1}^{\infty} \frac{5n - 2}{n^3 + 3}$$

converges or diverges. Briefly **JUSTIFY** your answer.

6. (13 points) Determine if the series

$$\sum_{n=1}^{\infty} \frac{7n^2}{11n^2 + 31}$$

converges or diverges. Briefly **JUSTIFY** your answer.

7. (13 points) Determine if the series

$$\sum_{n=1}^{\infty} \frac{3 + (\cos n)^2}{n}$$

converges or diverges. Briefly **JUSTIFY** your answer.

8. (13 points) Determine if the series

$$\sum_{n=1}^{\infty} (-1)^n \frac{1}{\sqrt{n}}$$

converges or diverges. Briefly **JUSTIFY** your answer.