

# MATH 2260

## Midterm Exam III

April 23, 2013

**NAME (please print legibly):** \_\_\_\_\_

**Your University ID Number:** \_\_\_\_\_

Please complete all questions in the space provided. Draw a box around your final answer. You may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully, and neatly (part of your grade will be based on how well your work is presented).

Try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
<b>TOTAL</b>	<b>60</b>	

**1. (10 points)** Find the limit of the **sequence**

$$\lim_{n \rightarrow \infty} \frac{\ln n}{\sqrt{n}}$$

**2. (10 points)** Does the **series**

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

converge or diverge? Use any test you like.

**3. (10 points)** Does the series

$$\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}e^n}$$

converge or diverge? Use any test you like.

**4. (10 points)** Consider the power series

$$\sum_{n=1}^{\infty} \frac{1}{n^3} \frac{(x-1)^n}{3^n}.$$

What is the center of the power series? What is the radius of convergence? (To save time, you can skip checking convergence at the endpoints of the interval.)

**5. (10 points)** Does the series

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

converge or diverge? Use any test you like.

**6. (10 points)** The power series

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$$

converges for  $x \in (-1, 1)$ . Use this information to find a power series for  $\frac{1}{1+x}$  and a power series for  $(1+x)\ln(1+x) - x$  on the interval  $(-1, 1)$ .