Name:_____

Student ID:_____

Section:_____

Instructor:_____

# Math 2414 (Calculus II)
# Practice Exam 3

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Instructions:

- Work on scratch paper will not be graded.
- Show all your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer.
- **Please write neatly. If I cannot read your handwriting, you will not receive credit.**
- Simplify your answers as much as possible. Expressions such as $\ln(1)$, $e^0$, $\sin(\pi/2)$, etc. must be simplified for full credit.

**Show all work in the space provided. Full credit will be given only if all steps are shown justifying your answer. Please write neatly and carefully, if I cannot read your handwriting, you will receive NO credit.**

1. (5 points) Find the formula for the **nth** term of the sequence

$$\frac{1}{2}, -\frac{4}{3}, \frac{9}{4}, -\frac{16}{5}, \frac{25}{6} \dots$$

2. (5 points) Explain why the given series diverges.

$$\sum_{n=1}^{\infty} \ln\left(\frac{n}{3n+1}\right).$$

3. (5 points) Find the sum of the series

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

4. (10 points) Explain why the integral test can be applied to the series. Then apply the test to determine whether the series converges or diverges.

$$\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}.$$

5. (5 points) Determine whether the series converges or diverges and explain why.

$$1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \frac{1}{5\sqrt{5}} + \dots .$$

6. (10 points) Determine whether the series converges or diverges and explain why.

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

7. (10 points) Explain why the series converges conditionally

$$\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n+1}.$$

8. (10 points) Determine whether the series converges absolutely or diverges. Show all work.

$$\sum_{n=1}^{\infty} \frac{(n!)^2}{(3n)!}.$$

9. (10 points) The terms of the series $\sum a_n$ are defined recursively as follows. Determine whether the series converges or diverges. Show all work.

$$a_1 = 1, a_{n+1} = \frac{2 + \cos n}{\sqrt{n}} a_n.$$

END OF EXAM