NAME ______________________ Rec. Instructor: ______________

Signature ______________________ Rec. Time __________

# CALCULUS II - EXAM 3
November 17, 2015

<u>Show all work</u> for full credit. No books, notes or calculators are permitted. The point value of each problem is given in the left-hand margin. You have 65 minutes.

| Problem | Points | Points Possible | Problem | Points | Points Possible |
|---|---|---|---|---|---|
| 1 | | 10 | 6 | | 10 |
| 2 | | 8 | 7a | | 5 |
| 3a | | 6 | 7b | | 5 |
| 3b | | 6 | 8 | | 6 |
| 3c | | 6 | 9a | | 6 |
| 4 | | 6 | 9b | | 6 |
| 5a | | 6 | 10 | | 8 |
| 5b | | 6 | | | |
| | | | Total Score | | 100 |

(10) 1. Use the integral test to determine whether the following series converges or diverges. (The right answer is worth 2 points. Showing work is worth 8 points.)

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

(8) 2. Use the limit comparison test to determine whether the following series converges or diverges. (The answer is worth 2 points, showing work 6 points.)

$$\sum_{n=1}^{\infty} \frac{n^2+7}{3n^5-n^2}$$

3. Determine whether the following series converge or diverge. State clearly which test you are using and implement the test as clearly as you can. (The answer for each problem is worth 2 points and the work you show 4 points.)

(6) a) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$

(6) b) $\displaystyle\sum_{n=1}^{\infty} \cos(1/n)$

(6) c) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{n}{2n+3}\right)^{n}$

(6) 4. Let $S = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$, and $S_n$ denote the $n$-th partial sum. How many terms are required so that the error $|S - S_n|$ is less than $.01$, where $S_n$ denotes the $n$-th partial sum?

5. Determine whether the following series converge conditionally, converge absolutely, or diverge. (The answer is worth 2 points, the work 4 points.)

(6) a) $\displaystyle\sum_{n=2}^{\infty} \frac{\cos(n)}{n^{3/2}}$

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

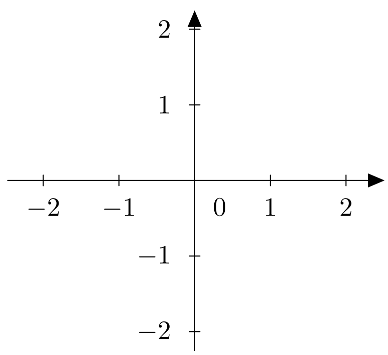
(10) 6. Find the interval of convergence of the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x-3)^n}{n\, 3^n}$. (Make clear the status of any end points.)

(5) 7. a) Use sigma notation to write down the general formula for the Taylor series of $f(x)$ centered at $x = c$.

(5) b) Apply the formula in part (a) to find the Maclaurin series ($c = 0$) for $f(x) = e^{2x}$. (Start by finding the $n$-th derivative of $f(x)$.)

(6) 8. Given $\ln(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}x^n}{n} = x - \frac{x^2}{2} + \frac{x^3}{3} - \cdots$ , $\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ , find the terms up to $x^5$ in the Maclaurin series for $\ln(1+x^2)\sin x$ .

(6) 9. a) Sketch the graph of the curve given by the parametric equations $x = 2\sin t$ , $y = \cos t$ , $0 \le t \le 2\pi$ . Indicate the starting point ( $t = 0$ ) and place an arrow to indicate the direction traveled.




(6) b) Eliminate the parameter $t$ to express the curve in part a) as an equation in terms of $x$ and $y$ .

(8) 10. A curve is given by the parametric equations $x = 2t - \sin t$ , $y = 1 - \cos t$ . Find the slope $dy/dx$ of the curve at $t = \frac{\pi}{2}$ .