Test 3 **Calculus II** **April 25, 2019**

MATH 129 **Dr. Abdul-Rahman**

Name: _____ **Signature:** _____

Show all your work!

1. [15 points] **Choose two to solve**: Determine whether each of the following series is convergent or divergent, show your work.

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

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

   (c) $\sum_{n=0}^{\infty} \frac{2^n+n}{n^2+4}$

2. [15 points] **Choose two to solve**: Determine whether each of the following series is convergent or divergent, show your work.

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

   (b) $\displaystyle\sum_{k=1}^{\infty} \frac{3 + \sin k}{k^{1.1}}$

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

3. [15 points] Find the radius of convergence of the following series

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

4. [15 points] Determine whether the following series are absolutely convergent, conditionally convergent, or divergent, show your work.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$

   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n n}{n+5}$

5. [15 points]

(a) Find the Taylor series of $f(x) = \sin(x^2)$ around $x = 0$.

(b) Find the Taylor series of $\int_0^x \sin(t^2)\, dt$ around $x = 0$.

6. [15 points] Find the first three (nonzero) terms of the Taylor series of

$$f(x) = \frac{e^{-x}}{1-x}$$

around $x = 0$.

7. [15 points] Consider the differential equation

$$\frac{dR}{dt} = -2(R-2)(R+1)(R+2).$$

(a) Find all the equilibrium solutions.

(b) Classify the equilibrium solutions as stable or unstable.