Name:____ **4/2/2020**

Math 20200-PR/RS: Calculus II **Exam 2**

Please print this exam and take take it in a quiet environmnt as you would take an exam in class – without any assistance. You should be able to complete this exam in under 2 hours. When you are done, you should compare your answers to the solutions posted at `johnadamski.com/212s2020.html`.

1. Determine whether the sequence converges or diverges. If the sequence converges, find the limit of the sequence.

$$a_n = \frac{\sin n}{n}$$

2. For each of the following series, determine whether the series converges or diverges. If the series converges, find the sum of the series.

   (a) $\displaystyle\sum_{n=0}^{\infty} e^{-2n}$

(b) $\displaystyle\sum_{n=1}^{\infty} \ln \frac{1}{3^n}$

3. For each of the following series, determine whether the series converges absolutely, converges conditionally, or diverges. State the name of any tests for convergence that you use, e.g. divergence test, integral test, p-test, direct comparison test, limit comparison test, ratio test, root test, alternating series test.

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

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{n^5+4}{\sqrt{9n^6-4}}$

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

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

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

4. For each of the following power series, find the interval of convergence (including possible endpoints).

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(x-1)^n}{n3^n}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{nx^n}{4^n(n^2+1)}$

5. (a) Find the Taylor series centered at $x = 0$ (i.e. Maclaurin series) generated by

$$f(x) = \frac{1}{1+x}.$$

(b) Use your answer to part (a) to find the taylor series centered at $x = 0$ for

$$F(x) = \ln(1+x).$$

Hint: $F'(x) = f(x)$. That is, F is an antiderivative of f.