Exam 3 **Calculus 2** **4/5/19**

Each problem is worth 10 points. For full credit provide good justification for your answers.

1. Find the sum of the geometric series

$$\frac{1}{2} - \frac{1}{4} + \frac{1}{8} - \frac{1}{16} + \frac{1}{32} - \frac{1}{64} + \frac{1}{128} - \frac{1}{256} + \ldots$$

2. Find the first 3 partial sums of the series

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

3. Find the 5^{th} degree MacLaurin polynomial for $f(x) = e^x$.

4. Determine whether the series $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n+1}}$ converges or diverges.

5. Determine whether the series $\sum_{n=0}^{\infty} \frac{1}{(2n+1)!}$ converges or diverges.

6. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$ converges or diverges.

7. Biff is a Calculus student at Enormous State University, and he's having some trouble. Biff says "Crap, Calc isn't math! I mean, I can work out answers and stuff, but now they want reasons. How is that math? Like, on our last exam, there was this one where we were supposed to multiple guess, like, which series you'd know diverged by the test for divergence. How stupid is that? If the answer isn't, like, 7 or something, then it's not math. I think this is really philosophy or something."

   Help Biff out by giving an example of a series that the Test for Divergence tells us is divergent, and explain why.

8. Find the radius of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{x^n}{n}$$

9. Find the interval of convergence of the power series

$$\sum_{n=0}^{\infty}(-1)^n \frac{x^n}{n!}$$

10. Use a power series with at least 3 nonzero terms to approximate

$$\int_0^{0.1} \cos(x^2)\, dx$$

Extra Credit [5 points possible]: Find the sum of the series

$$\frac{1}{2} - \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} - \frac{1}{64} + \frac{1}{128} + \frac{1}{256} + \frac{1}{512} - \frac{1}{1024} + \ldots$$