Exam 3 **Calculus 2** **3/30/18**

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

1. Find the first 3 partial sums of the series

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

2. Find the sum of the geometric series

$$\frac{1}{3} - \frac{2}{9} + \frac{4}{27} - \frac{8}{81} + \ldots$$

3. Find the 6^{th} degree MacLaurin polynomial for $f(x) = \cos x$.

4. Determine whether the series $\sum_{n=1}^{\infty} \frac{1}{1+n^2}$ converges or diverges.

5. Determine whether the series $\sum_{n=1}^{\infty} \frac{1+5^n}{1+3^n}$ converges or diverges.

6. Find the Taylor series of degree 3 centered at $x = 9$ for $f(x) = \sqrt{x}$.

7. Biff is a Calculus student at Enormous State University, and he's having some trouble. Biff says "Crap, Calc is so impossible! Every time I think I know how to do it, they tell me it's not that simple anymore. So I did the test for series, right? Like, for $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$ I said Comparison test, right? Since I know it's less than $\sum_{n=1}^{\infty} \frac{1}{n^2}$, right, so it converges? But they said that was wrong because something stupid, so I think I'm just going to drop out and be homeless."

   Help Biff out by explaining what might be wrong with his approach.

8. Find the radius of convergence of the power series

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

9. Use a power series with at least 4 nonzero terms to approximate

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

10. Determine the interval of convergence of the power series

$$\sum_{n=0}^{\infty} \frac{x^{2n+1}}{2n+1}$$

Extra Credit [5 points possible]: Evaluate

$$\sum_{n=1}^{k} \frac{1}{n(n+1)}$$