Final Exam
Calculus 2
Spring 2018

Name:_____

Please explain all your thinking in detail. You are not allowed to use a graphing calculator or any notes for the exam.

Skills/Facts: (20 points)

1. Write down the equation of the Taylor series of a function $f(x)$ at $x = a$.

2. Compute the integral $\int xe^x dx$.

Methods: (40 points)

3. For which x does the following power series converge? Explain your thinking.

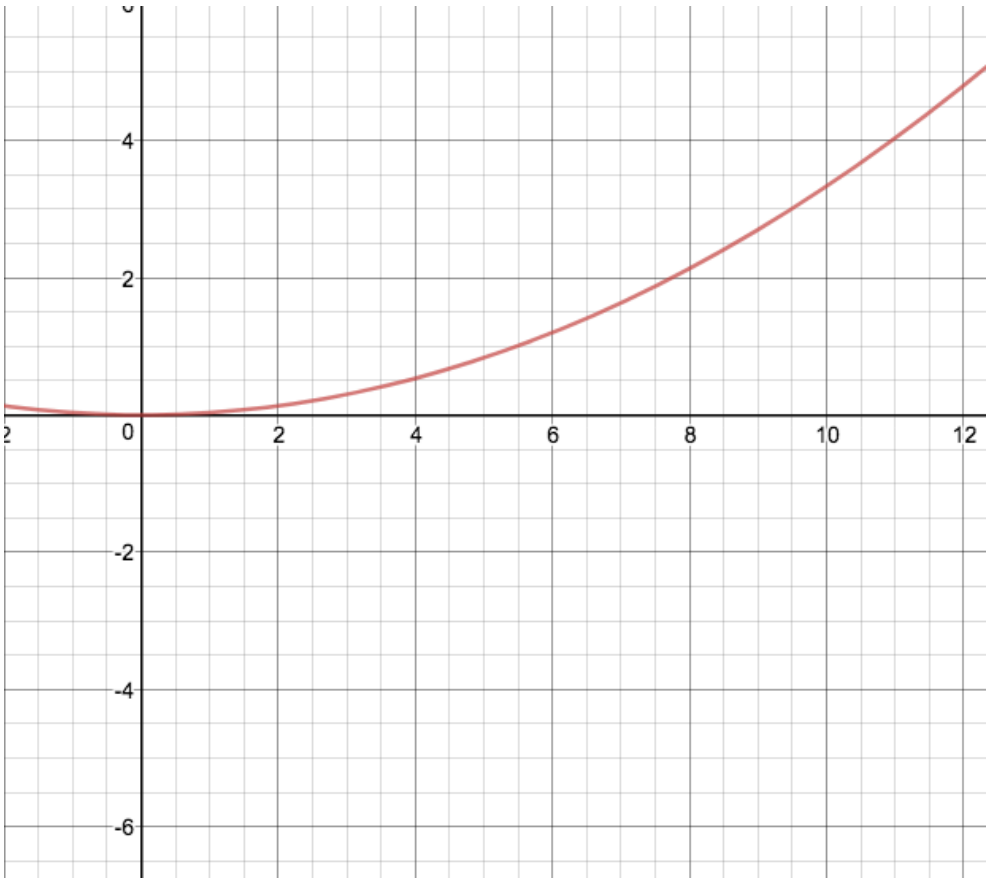
$$\sum_{k=1}^{\infty} \frac{(-1)^k}{k4^k}(x-4)^k$$

4. Decide if the following integral is convergent or divergent. Explain your thinking.

$$\int_0^5 \frac{2}{(x-3)}\,dx$$

Conceptual Understanding: (40 points)

5. Shade the region between the red graph of the function $g(x)$ and the x-axis and between $x = 0$ and $x = 10$, in the following picture. Now rotate this region around the x-axis.



   a. What does the resulting 3-dimensional shape S look like? Draw a picture.
   b. Explain how you would use 5 subdivisions to estimate the volume of S. (You don't have to actually estimate it)
   c. Which integral would compute the volume of S precisely? (You don't have to actually compute it)

6. Use the example of the p-series $\sum_{k=1}^{\infty} \frac{1}{k^2}$ to explain **why** the integral test works. Draw pictures to explain your thinking.

Extra Credit:

7. The following picture shows the convergence of a specific series.
    a. Which series is it?
    b. Which value does the series have according to the picture?
    c. Find a (different) computational way to compute the (same) value of the series.