Math 1620 Calculus II Your Name:________________________

Corning Community College

Instructor: Jay Hurlburt

Exam 5 (Sec 9.7-9.10)

Directions: Please answer all questions neatly, clearly and completely. Simplify your answers only when directed to do so. Unless otherwise indicated, each problem is worth 10 points.

1. Use the **definition** to find the Maclaurin **polynomial** of degree 4 for the function $f(x) = \cos x$.

2. (5points) Use the pattern in problem #1 to write a Maclaurin **series** for the function $f(x) = \cos x$

3. (5points) Use the pattern in the power series in problem #2 to write a Maclaurin power series for $g(x) = \cos(3x)$

4. Use the definition to find the Taylor **polynomial** of degree 3 for the function $f(x) = e^{2x}$ centered at $c = 1$.

5. (5points) Consider the power series

$$f(x) = \ln x = (x-1) - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \frac{(x-1)^4}{4} + \cdots + \frac{(-1)^{n-1}(x-1)^n}{n} + \cdots,$$

$0 < x \leq 2$

a. Differentiate the above series to determine a power series for $f'(x) = \frac{1}{x}$ centered at 1.

6. (5points) Use the binomial expansion to write a power series representation for

$$f(x) = \frac{1}{(1+x^2)^3}$$

7. Consider the function $f(x) = \dfrac{4}{2x - 5}$.

a. Find a geometric power series for the function centered at $c = 0$.

b. Determine the interval of convergence of the power series.

8. Consider the integral $f(x) = \int e^{-x^2} dx$. Recall that this integral has no elementary function as its antiderivative. Use the fact that $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!} + \cdots$ to obtain a **power series** representation for this integral centered at $c = 0$.

9. Determine the **interval of convergence** of the series $\sum_{n=1}^{\infty} \frac{x^n}{n!}$. Be sure to check the endpoints!

10. Determine the **interval of convergence** of the series $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n3^n}$. Be sure to check the endpoints!