MTH 146 – Calculus II
Practice Exam 2

Name: _____ Date: _____

Show all of your work. Whenever you use a test or theorem, name it and verify that its conditions are satisfied. Answers without supporting work will not receive full credit.

1. Determine whether the integral is convergent or divergent. If it is convergent, evaluate it.

$$\int_{-2}^{3} \frac{9}{x^4}\, dx$$

2. Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = \frac{(5n-1)!}{(5n+1)!}$$

3. Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = n^2 e^{-5n}$$

4. Determine whether the series is convergent or divergent. If it is convergent, find its sum.

$$\sum_{n=1}^{\infty} \left(\frac{9}{e^n} + \frac{2}{n(n+1)} \right)$$

For Problems 5–14: Determine whether the series is *absolutely convergent*, *conditionally convergent*, or *divergent*. **State which test you are using**, verify its conditions, and justify your answer. Choose from the following tests:

- Test for Divergence
- Geometric Series
- p-Series
- Integral Test
- Direct Comparison Test
- Limit Comparison Test
- Alternating Series Test
- Ratio Test
- Root Test

5.

$$\sum_{n=1}^{\infty} \frac{5}{\sqrt{n^2+7}}$$

6.

$$\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{n^3+9}$$

7.

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 10n + 26}$$

8.

$$\sum_{n=1}^{\infty} \frac{1 + \sin n}{e^n}$$

9.

$$\sum_{n=0}^{\infty} \frac{(-4)^n}{(2n+1)!}$$

10.

$$\sum_{n=1}^{\infty} \frac{1}{5+e^{-n}}$$

11.

$$\sum_{n=2}^{\infty} \frac{n+7}{(n+3)^3}$$

12.

$$\sum_{n=5}^{\infty} 2\left(1+\frac{1}{n}\right)^{n^2}$$

13.

$$\sum_{n=1}^{\infty} \frac{e^{2/n}}{n}$$

14.

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

15. Approximate the sum of the series correct to four decimal places.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^9}$$

16. Find the radius of convergence and the interval of convergence of the series.

$$\sum_{n=2}^{\infty} \frac{(x+2)^n}{2^n \ln n}$$

17. Find the radius of convergence and the interval of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{(-1)^n 8^n}{\sqrt{n}}\, x^n$$

18. Find a power series representation for the function centered at $x = 0$, and find its radius of convergence.

$$f(x) = \frac{1}{(8+x)^2}$$

19. Find a power series representation for the function centered at $x = 0$, and find its radius of convergence.

$$f(x) = \ln(11 - x)$$

20. Find a power series representation for the function centered at $x = 0$, and determine the interval of convergence.

$$f(x) = \frac{x^2}{x^4 + 81}$$