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## Math 152 Week-in-Review

### Exam 3 Review

1. Determine if the series converges or diverges. FULLY explain your reasoning.

(a) 
$$\sum_{n=1}^{\infty} \frac{2 + 3 \cos n}{n^3 + 4n^2}$$

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

(c) 
$$\sum_{n=3}^{\infty} \frac{5 + \sin n}{n - 4\sqrt{n}}$$

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

2. Determine if the series converges absolutely, converges conditionally, or diverges. FULLY explain your reasoning.

a.) 
$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n(3 + \ln n)^3}$$

b.) 
$$\sum_{n=1}^{\infty} \frac{2}{n\sqrt{n}}$$

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

d.) 
$$\sum_{n=1}^{\infty} \frac{(-1)^n}{5n + 1}$$

e.) 
$$\sum_{n=1}^{\infty} \frac{(-10)^n n!}{(2n + 3)!}$$

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3. Find the radius and interval of convergence for  $\sum_{n=2}^{\infty} \frac{(x+3)^n}{5^n \sqrt{n-1}}$ . FULLY explain your reasoning.

4. Find the radius and interval of convergence for  $\sum_{n=0}^{\infty} \frac{(2x-3)^{n+1} n!}{100^n}$ . FULLY explain your reasoning.

5. If  $\sum_{n=0}^{\infty} c_n(x+2)^n$  converges at  $x=5$ , on what interval are we guaranteed convergence?

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6. For the series  $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n^2}{(n+3)!}$ , Use the Alternating Series Estimation Theorem to find an upper bound for the error if we used  $s_5$  to estimate the sum.

7. Using The Alternating Series Estimation Theorem, what is the smallest value of  $n$  that guarantees  $s_n$  approximates  $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n+3}$  with error less than  $\frac{1}{20}$ ?

8. Find a power series centered at 0 for the following functions:

a.)  $\frac{4}{6 - x^2}$

b.)  $\frac{8x}{(6 - x^2)^2}$ , by using the result from above.

c.)  $\int x^4 \arctan(5x) dx$

9. Evaluate  $\int_0^1 x^4 \ln(2 - x^3) dx$

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10. Find  $f^{(26)}(2)$  if  $f(x) = \sum_{n=0}^{\infty} \frac{3^{n+1}(x-2)^n}{(n+8)!}$  is the Taylor Series for  $f(x)$  centered at  $a = 2$ .

11. Find the Taylor Series centered at 4 for  $f(x) = \frac{1}{(x+1)^2}$ .

12. Find a Maclaurin series for  $e^{3x^2}$ .

13. Express  $\int x^4 \cos(5x^3) dx$  as a power series about 0.

14. Find the sum of the series  $\sum_{n=0}^{\infty} \frac{(-1)^n 2^{2n+1}}{(2n+1)!}$

15. Find the sum of the series  $\sum_{n=0}^{\infty} \frac{(-5)^n 2^{2n+1}}{n!}$



16. Find the third degree Taylor Polynomial for  $f(x) = e^{-x}$  at  $x = 2$ .