

Name:

Math 116 Exam 2

November 6, 2014

Directions: WRITE YOUR NAME ON THIS TEST! Except where indicated, merely finding the answer to a problem is not enough to receive full credit; you must show how you arrived at that answer. Unless otherwise indicated, decimal approximations for a numerical answer accurate to 4 decimal places are acceptable.

1) (10 points, 2 points each) True/False. If the sentence is false, correct the error. No justification is necessary.

a) $\sum_{n=0}^{\infty} \frac{x^n}{n!} = \cos(x)$ for all real numbers x .

b) If the center of a power series is $c = 2$ and the radius of convergence is $R = 3$, then the power series converges for $x = 1$.

c) The sum of a convergent series is the limit of its partial sums.

d) If p is a real number, then $\int_1^{\infty} \frac{dx}{x^p}$ diverges if $p > 1$ and converges if $p \leq 1$.

e) If $\lim_{n \rightarrow \infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ converges.

2) (15 points) Evaluate the integral $\int_1^6 \frac{dx}{x^2 + 7x - 18}$.

3) Consider the power series $\sum_{n=0}^{\infty} \frac{(24 - 6x)^n}{\sqrt[8]{n^7 + 12}}$.

- a) (3 points) What is the center of the series?
- b) (12 points) Find the radius of convergence of the series.

4) (12 points) Given that the radius of convergence of $\sum_{n=0}^{\infty} \frac{(24 - 6x)^n}{\sqrt[8]{n^7 + 12}}$ is $1/6$, find the interval of convergence.

5) Find the sum of the series or show the series diverges.

a) (6 points) $\sum_{n=8}^{\infty} \arctan(n - 1)$

b) (10 points) $\sum_{n=4}^{\infty} \frac{(-7)^{n+1}}{2^{3n}}$

c) (11 points) $\sum_{n=0}^{\infty} \frac{1}{17^{n+3}(n + 1)}$

6) Determine the limit of the sequence or show that no limit exists.

a) (10 points) $\left(\left(\frac{n+14}{n} \right)^{n/7} \right)_{n=1}^{\infty}$

b) (11 points) $\left(\frac{(n-1)!}{\sin\left(\frac{11}{n}\right) \cdot n!} \right)_{n=4}^{\infty}$

BONUS: (10 points) Two trains are on the same track a distance 60 miles apart heading towards one another, each at a speed of 30 mph. A fly starting out at the front of one train flies towards the other at a speed of 35 mph. Upon reaching the other train, the fly turns around and continues towards the first train. When it reaches the first train, it turns around and flies towards the other train, and so on. How many miles does the fly travel before getting squashed in the collision of the two trains?