Problem 1. 1. (7 pts) Consider the series

$$\sum_{n=1}^{\infty} \frac{10^n}{(n+1)6^{2n+1}}$$

In this problem you must attempt to use the Ratio Test to decide whether the series converges.

Compute

$$L = \lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$$

Enter the numerical value of the limit L if it converges, INF if it diverges to infinity, MINF if it diverges to negative infinity, or DIV if it diverges but not to infinity or negative infinity.
$L =$ _____

Which of the following statements is true?
A. The Ratio Test says that the series converges absolutely.
B. The Ratio Test says that the series diverges.
C. The Ratio Test says that the series converges conditionally.
D. The Ratio Test is inconclusive, but the series converges absolutely by another test or tests.
E. The Ratio Test is inconclusive, but the series diverges by another test or tests.
F. The Ratio Test is inconclusive, but the series converges conditionally by another test or tests.
Enter the letter for your choice here: _____

Answer(s) submitted:

- `((3/5)(ln(18/13)) - (1/6))`
- `A`

(incorrect)

Problem 2. 2. (6 pts) Consider the power series:

$$\sum_{n=1}^{\infty} \frac{(x-5)^n}{n(-3)^n}$$

The interval of convergence goes from $x =$ ___ to $x =$ ___.
The radius of convergence is $R =$ _____.

If needed, enter *INF* for ∞ and *MINF* for $-\infty$.

Answer(s) submitted:

- `2`
- `8`
- `3`

(correct)

Problem 3. 3. (8 pts)
a) Consider the function $\arctan(x^2)$.

Write a partial sum for the power series which represents this function consisting of the first 4 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6$. Also indicate the radius of convergence.

Partial Sum: _____
Radius of Convergence: _____

b) Use part a) to write the partial sum for the power series which represents $\int \arctan(x^2)dx$.

Write the first 4 nonzero terms. Also indicate the radius of convergence.

Partial Sum: _____
Radius of Convergence: _____

c) Use part b) to approximate the integral $\int_0^{0.2} \arctan(x^2)dx$.

_____

Answer(s) submitted:

- `(x^2)-((x^6)/3)+((x^10)/5)-((x^14)/7)`
- `1`
- `((x^3)/3)-((x^7)/21)+((x^11)/55)-((x^15)/105)`
- `1`
- `0.000133318`

(score 0.800000011920929)

Problem 4. 4. (7 pts) Find the length of the curve

$$x = 1+18t^2, \quad y = 9+12t^3, \quad 0 \le t \le 5.$$

_____.

Answer(s) submitted:

- `864000`

(incorrect)

Problem 5. 5. (6 pts) Consider the series

$$-11/8+121/64-1331/512+14641/4096+\cdots$$

Determine whether the series converges, and if it converges, determine its value.

Enter the value if the series converges, or enter *DNE* if it diverges: _____

Answer(s) submitted:

- `DNE`

(correct)

Problem 6. 6. (7 pts)

The function $f(x) = \sin(6x)$ has a Maclaurin series. Find the first 4 nonzero terms in the series, that is write down the Taylor polynomial with 4 nonzero terms.

Answer(s) submitted:

- `(6x) - (36(x^3)) + ((324(x^5))/5)+((1944(x^7))/35)`

(incorrect)

Problem 7. 7. (5 pts) Assume time t runs from zero to 2π and that the unit circle has been labled as a clock.
Match each of the pairs of parametric equations with the best description of the curve from the following list. Enter the appropriate letter (A, B, C, D, E, F) in each blank.

A. Starts at 12 o'clock and moves clockwise one time around.
B. Starts at 6 o'clock and moves clockwise one time around.
C. Starts at 3 o'clock and moves clockwise one time around.
D. Starts at 9 o'clock and moves counterclockwise one time around.
E. Starts at 3 o'clock and moves counterclockwise two times around.
F. Starts at 3 o'clock and moves counterclockwise to 9 o'clock.

___1. $x = -\sin(t);\ y = -\cos(t)$
___2. $x = -\cos(t);\ y = -\sin(t)$
___3. $x = \cos(t);\ y = -\sin(t)$
___4. $x = \sin(t);\ y = \cos(t)$
___5. $x = \cos(2t);\ y = \sin(2t)$

Answer(s) submitted:

-
-
-
-
-

(incorrect)

Problem 8. 8. (6 pts) Suppose parametric equations for the line segment between $(4,5)$ and $(7,-2)$ have the form:

$$x = a + bt$$
$$y = c + dt$$

If the parametric curve starts at $(4,5)$ when $t = 0$ and ends at $(7,-2)$ at $t = 1$, then find a, b, c, and d.
$a =$ _____,

$b =$ _____,

$c =$ _____,

$d =$ _____.

Answer(s) submitted:

- `4`
- `3`
- `5`
- `-7`

(correct)

Problem 9. 9. (8 pts) Suppose that $\dfrac{4x}{(11+x)} = \sum_{n=0}^{\infty} c_n x^n$.
Find the first few coefficients.
$c_0 =$ _____

$c_1 =$ _____

$c_2 =$ _____

$c_3 =$ _____

$c_4 =$ _____

Find the radius of convergence R of the power series.
$R =$ _____ .

Answer(s) submitted:

-
-
-
-
-
-

(incorrect)

Problem 10. 10. (6 pts) Match each of the Maclaurin series with right function.

___1. $\displaystyle\sum_{n=0}^{\infty} \frac{2^n x^n}{n!}$
___2. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 2^{2n} x^{2n}}{(2n)!}$
___3. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 2x^{2n+1}}{2n+1}$
___4. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \frac{2x^{2n+1}}{(2n+1)!}$

A. e^{2x}
B. $2\sin(x)$
C. $2\arctan(x)$
D. $\cos(2x)$

Answer(s) submitted:

- `A`
- `D`
- `C`
- `B`

(correct)

Problem 11. 11. (8 pts) The Taylor series for $f(x) = \cos(x)$ at a = $\frac{\pi}{4}$ is $\sum_{n=0}^{\infty} c_n (x - \frac{\pi}{4})^n$.
Find the first few coefficients.
$c_0 =$ _____

$c_1 =$ _____

$c_2 =$ _____

$c_3 =$ _____

$c_4 =$ _____

Answer(s) submitted:

- (1/sqrt(2))
- -(1/sqrt(2))
- -(1/(2sqrt(2)))
- (1/(6sqrt(2)))
- (1/(24sqrt(2)))

(correct)

Problem 12. 12. (6 pts) Match the series with the right expression. (Use the Maclaurin series.)

___1. $\sum_{n=0}^{\infty} \frac{\left(\frac{1}{3}\right)^n}{n!}$

___2. $\sum_{n=0}^{\infty} \frac{(-1)^n \left(\frac{1}{3}\right)^{2n+1}}{2n+1}$

___3. $\sum_{n=0}^{\infty} \frac{(-1)^n \left(\frac{1}{3}\right)^{2n}}{(2n)!}$

___4. $\sum_{n=0}^{\infty} (-1)^n \frac{\left(\frac{1}{3}\right)^{2n+1}}{(2n+1)!}$

A. $\cos\left(\frac{1}{3}\right)$
B. $e^{1/3}$
C. $\arctan\left(\frac{1}{3}\right)$
D. $\sin\left(\frac{1}{3}\right)$

Answer(s) submitted:

- B
- C
- A
- D

(correct)

Problem 13. 13. (6 pts) Eliminate the parameter to find the cartesian equation of the curve:

$$x = 7\sin\theta,\ y = \cos^2\theta,\ -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$$

The equation of the curve is:
y = _____
from x = _____ to x = _____

Answer(s) submitted:

- (1-((x/7)^2))
- -7
- 7

(correct)

Problem 14. 14. (8 pts)
Consider the parametric curve:

$$x = 7 + 13\cos t, \quad y = 9 + 13\sin t, \quad \pi/2 \le t \le 3\pi/2$$

The cartesian equation of the curve has the form $(x-h)^2 + (y-k)^2 = R^2$
with
$h =$ _____
$k =$_____ and
$R =$_____
The initial point has coordinates: $x =$ _____ , $y =$_____ .
The terminal point has coordinates: $x =$_____ , $y =$_____ .
The curve is traced _____ (enter *clockwise* or *counterclockwise*)

Answer(s) submitted:

- 7
- 9
- 13
- 7
- 22
- 7
- -4
- counterclockwise

(correct)

Problem 15. 15. (6 pts)
Find the values of x so that the series below converges.

$$\sum_{n=0}^{\infty} \frac{(x-6)^n}{12^n}$$

Give your answer in interval notation.
(_____, _____)

Answer(s) submitted:

- -6
- 18

(correct)