2. Find the sum: $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{(2n)!}$.

   (a) None of these
   (b) -1
   (c) 0
   (d) $\frac{1}{1+\pi^2}$
   (e) $e^{-\pi^2}$

Find the sum (a) $\sum_{n=1}^{\infty} \frac{4^n}{n!}$

(b) $\sum_{n=2}^{\infty} \frac{4^n}{n!}$

3. Which statement is true regarding the convergence or divergence of $\sum_{n=1}^{\infty} \frac{1+\sin^2 n}{n^2}$?

   (a) The series converges by the Limit Comparison Test with $\sum_{n=1}^{\infty} \frac{2}{n^2}$.
   (b) The series diverges by the Limit Comparison Test with $\sum_{n=1}^{\infty} \frac{1}{n}$.
   (c) The series converges by the Comparison Test with $\sum_{n=1}^{\infty} \frac{2}{n^2}$.
   (d) None of the other statements is true.
   (e) The series diverges by the Comparison Test with $\sum_{n=1}^{\infty} \frac{1}{n}$.

5. The series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ converges to s. Based on the Alternating Series Estimation Theorem, which statement is true?

(a) $|s - s_7| < \frac{1}{49}$

(b) $|s - s_7| < \frac{1}{7}$

(c) None of these

(d) $|s - s_7| < \frac{1}{8}$

(e) $|s - s_7| < \frac{1}{64}$

6. Given the power series for $\frac{1}{1-x}$ is $\sum_{n=0}^{\infty} x^n$ for $-1 < x < 1$, which of the following is a power series for $f(x) = \frac{1}{(1-x)^2}$?

(a) $\sum_{n=0}^{\infty} x^{2n}$

(b) $\sum_{n=1}^{\infty} nx^{n-1}$

(c) $\sum_{n=1}^{\infty} (-1)nx^{n-1}$

(d) $\sum_{n=0}^{\infty} \frac{x^{n+1}}{n+1}$

(e) None of these

11. Which statement is true regarding the series $\sum_{n=1}^{\infty}(-1)^n \frac{4}{\sqrt{n^2+4}+n}$:

(a) None of the other statements is true.
(b) The series is absolutely convergent by the Test for Divergence.
(c) The series is divergent.
(d) The series is convergent, but not absolutely convergent.
(e) The series is absolutely convergent by the Ratio Test.

12. Given the Maclaurin Series for a function f is defined by $f(x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}x^n}{n2^n}$, what is $f^{(10)}(0)$ (the tenth derivative of f at $x = 0$)?

(a) $-\frac{1}{10 \cdot 2^{10}}$
(b) None of these
(c) $-\frac{9!}{2^{10}}$
(d) $\frac{1}{10 \cdot 2^{10}}$
(e) $\frac{9!}{2^{10}}$

13. For which series below is the Ratio Test inconclusive?

(a) $\sum_{n=0}^{\infty} \frac{1}{2^n}$

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

(c) None of these

(d) $\sum_{n=0}^{\infty} \frac{3^n}{5^{n-1}}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^n}{4n^2+3n+3}$

14. Which of the following is the 3rd degree Taylor Polynomial for $f(x) = x + \sin(2x)$ centered at $a = 0$?

(a) $T_3(x) = 3x - \frac{4}{3}x^3$

(b) None of these

(c) $T_3(x) = 3x - 8x^3$

(d) $T_3(x) = 2x - \frac{1}{3}x^3$

(e) $T_3(x) = 2x - 2x^3$

15. What is the radius of convergence of $\sum_{n=0}^{\infty} \frac{(2012)^n x^n}{n!}$?

(a) ∞

(b) None of these

(c) $\frac{1}{2012}$

(d) 0

(e) 2012

16. (5 points) Find the Taylor Series for $f(x) = e^{-x}$ centered at $a = 3$.

17.

(a) (6 points) Find a power series representation for $f(x) = \dfrac{1}{2+4x}$ about $a = 0$.

(b) (2 points) What is the radius of convergence of the series in part (a)?

(c) (4 points) Use your series in part (a) to find the Maclaurin series for $\ln(2+4x)$.

18. (8 points) Find the radius and interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(-1)^n (x-2)^n}{\sqrt[3]{n+2}}$. Be sure to test the endpoints for convergence.

13. (12 pts) Express $f(x) = \ln(5 - x^3)$ as a power series about $x = 0$ and identify the radius of convergence.

4. (4 pts) Using the Alternating Series Estimation Theorem, how many terms of the series do we need to add in order to find the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ with error less than $\frac{1}{60}$?

   (a) $n = 3$
   (b) $n = 4$
   (c) $n = 5$
   (d) $n = 7$
   (e) $n = 6$

5. (4 pts) Which of the following series converge absolutely?

   (a) $\sum_{n=1}^{\infty} (-1)^n$
   (b) $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n\sqrt{n}}$
   (c) $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$
   (d) $\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln n}$
   (e) All of the above series are absolutely convergent.

7. (4 pts) The Interval of Convergence of the series $\sum_{n=0}^{\infty} \frac{(x+1)^n(2n+1)!}{10^n n!}$ is:

(a) $I = (-11, 9)$

(b) $I = \left(-\frac{1}{10}, \frac{1}{10}\right)$

(c) $I = [-11, 9)$

(d) $I = (-\infty, \infty)$

(e) $I = \{-1\}$

9. (4 pts) $\arctan(x^3) =$

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

(b) $\sum_{n=0}^{\infty} \frac{x^{6n+3}}{2n+1}$

(c) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{6n+3}}{2n+1}$

(d) $\sum_{n=0}^{\infty} \frac{x^{6n+1}}{6n+1}$

(e) $\sum_{n=0}^{\infty} \frac{(-1)^n x^{6n}}{6n+1}$

12. (i) (4 pts) Find a Maclaurin Series representaton for $f(x) = \sin\left(\frac{x^2}{3}\right)$.

(ii) (6 pts) Using the result in part (i), write $\int_0^1 \sin\left(\frac{x^2}{3}\right)\, dx$ as an infinite series.