

No calculators.

No pens: -10 pts.

No questions regarding content: -10 pts.

No late exams accepted. -100 pts.

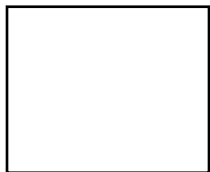
No smart phones anywhere: -100 pts.

1. Test the series for convergence or divergence. Name the test utilized. Support your conclusion. If convergent, find the sum whenever possible.

a.
$$\sum_{n=0}^{\infty} \frac{2n^2}{n^2 + 1}$$

*Test :**Apply test / reasoning :**Converge / diverge :**Sum, if possible :*

b.
$$\sum_{n=0}^{\infty} (-1)^n \frac{4}{3^{n-1}}$$

*Test :**Apply test / reasoning :**Converge / diverge :**Sum, if possible :*

2. Find the center, radius, and the (open) interval of convergence for the power series. You need NOT test endpoints.

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

Center: $C =$

Radius: $R =$



(open) Interval of Convergence $\left(\quad , \quad \right)$

3. Find the center, radius , and the (open) interval of convergence for the power series,

$$f(x) = \sum_{n=0}^{\infty} \frac{(-1)^{n+1} x^{n+1}}{(n+1)!} . \text{ You need } \underline{\text{NOT}} \text{ test endpoints.}$$

Center: $C =$

Radius: $R =$



(open) Interval of Convergence (\quad , \quad)

4. Given the power series, $f(x) = \sum_{n=1}^{\infty} \frac{(-1)^n (x-2)^n}{3^n \cdot n}$, and the fact that the radius of convergence is $R = 3$ to find the interval of convergence, including testing endpoints.

Open interval of convergence
prior to testing endpoints:

(,)

TEST LEFT ENDPOINT:

TEST RIGHT ENDPOINT:

FINAL interval of Convergence Radius:
(after testing endpoints)

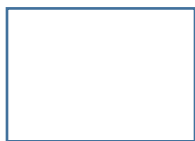
5. For the power series, $f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n (x-1)^{n+1}}{2^n \cdot (n+1)!}$ find **AND** simplify or rewrite n^{th} term for each of the following. You need **NOT** find interval of convergence, nor test endpoints.

$$f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n (x-1)^{n+1}}{2^n \cdot (n+1)!} = (x-1) - \frac{1}{2 \cdot 2!} (x-1)^2 + \frac{1}{2^2 \cdot 3!} (x-1)^3 - \frac{1}{2^3 \cdot 4!} (x-1)^4 + \frac{1}{2^4 \cdot 5!} (x-1)^5 - \dots$$

a. $f'(x) = \sum_{n=}$

$$f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n (x-1)^{n+1}}{2^n \cdot (n+1)!} = (x-1) - \frac{1}{2 \cdot 2!} (x-1)^2 + \frac{1}{2^2 \cdot 3!} (x-1)^3 - \frac{1}{2^3 \cdot 4!} (x-1)^4 + \frac{1}{2^4 \cdot 5!} (x-1)^5 - \dots$$

b. $\int f(x) dx = C + \sum_{n=}$



6. Use the definition of the Taylor Polynomial and Taylor Series to find the **5th** Taylor Polynomial for $f(x) = \sin 2x$ centered at $c = \pi$. Then use your polynomial to write the Taylor Series for $f(x) = \sin 2x$ centered at $c = \pi$.

$n = 0$			
$n = 1$			
$n = 2$			
$n = 3$			
$n = 4$			
$n = 5$			

5th Taylor polynomial: $P_5(x) =$

Taylor Series : $P(x) = \sum_{n = }^{\infty}$

7. Use the Maclaurin Series for $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$ to find **AND** simplify the series for

a. $f(x) = e^{-2x^4}$

b. $g(x) = x^3 e^x$

8. Suppose the interval of convergence for a particular power series $f(x)$ is $(-2, 1]$.
Answer the following, **TRUE OR FALSE**.

a. It is possible that the interval of convergence of $f'(x)$ is $(-2, 1)$. _____.

b. It is possible that the interval of convergence of $f'(x)$ is $[-2, 1]$. _____.

c. It is possible that the interval of convergence of $\int f(x) dx$ is $(-2, 1)$. _____.

d. It is possible that the interval of convergence of $\int f(x) dx$ is $[-2, 1]$. _____.

9. (4 points): In your opinion the greatest song (or recording) of all time (in any musical genre).

There is no wrong answer.