Math 141 PURPLE
Exam 3 4/20/16
#1-8:12 pts each. #9: 4 pts.

show all relevant work for full credit

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 **<u>center</u>, <u>radius</u>**, and the (open) **<u>interval of convergence</u>** for the power series. You need ***<u>NOT</u>*** 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 $(\quad , \quad)$

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

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

Center: $c=$

Radius: $R=$

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

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, ***<u>including</u>*** testing endpoints.

Open interval of convergence
prior to testing endpoints:

$\boxed{(\quad,\quad)}$

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.

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

a. $f^{/}(x)=\sum_{n=}^{\infty}$

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

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

6. Use the definition of the Taylor Polynomial and Taylor Series to find the **5**th 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 $c = \pi$.

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

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

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

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.