AP Calculus BC Name: ______________________

10.7 Worksheet Period: ____________

Find the nth MacLaurin polynomial for the given function.

1. $f(x) = e^{4x},\ n = 4$

2. $f(x) = e^{-x/2},\ n = 4$

3. $f(x) = \sin(x),\ n = 5$

4. $f(x) = \cos(\pi x),\ n = 4$

5. $f(x) = \mathrm{x}\mathrm{e}^{x},\ n = 4$

6. $f(x) = x^2\mathrm{e}^{-x},\ n = 4$

7. $f(x) = \frac{1}{x+1},\ n = 5$

8. $f(x) = \frac{x}{x+1},\ n = 4$

9. $f(x) = \sec(x),\ n = 2$

10. $f(x) = \tan(x),\ n = 3$

Find the nth Taylor polynomial for the given function centered at *c*.

11. $f(x) = \sqrt{x},\ n = 3,\ c = 4$

12. $f(x) = \sqrt[3]{x},\ n = 3,\ c = 8$

13. $f(x) = \ln(x),\ n = 4,\ c = 2$

14. $f(x) = \mathrm{x}^2 \cos(x),\ n = 2,\ c = \pi$

Determine the degree of the MacLaurin polynomial required for the error in the approximation of the function at the indicated value to be less than 0.001.

15. $f(x) = \sin(x),\ approximate\ f(0.3)$

16. $f(x) = \cos(x),\ approximate\ f(0.1)$

17. $f(x) = e^x,\ approximate\ f(0.6)$

18. $f(x) = \ln{(x)},\ approximate\ f(1.25)$

AP Calculus BC

10.8 Worksheet day 1

State where the power series is centered.

1. $\sum_{n=0}^{\infty}\left(\frac{x}{4}\right)^n$

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

3. $\sum_{n=1}^{\infty}\frac{(x-2)^n}{n^3}$

4. $\sum_{n=0}^{\infty}\frac{(-1)^n(x-\pi)^{2n}}{(2n)!}$

Find the radius of convergence of the power series (ignore endpoint convergence for now).

5. $\sum_{n=0}^{\infty}(-1)^n\left(\frac{x^n}{n+1}\right)$

6. $\sum_{n=0}^{\infty}(3x)^n$

7. $\sum_{n=1}^{\infty}\left(\frac{(4x)^n}{n^2}\right)$

8. $\sum_{n=0}^{\infty}\frac{(-1)^n x^n}{5^n}$

9. $\sum_{n=0}^{\infty} \frac{x^{2n}}{(2n)!}$

10. $\sum_{n=0}^{\infty} \frac{(2n)!x^{2n}}{n!}$

Find the interval of convergence of the power series.

11. $\sum_{n=0}^{\infty} \left(\frac{x}{4}\right)^n$

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

13. $\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n}$

14. $\sum_{n=0}^{\infty} (-1)^{n+1}(n+1)x^n$

15. $\sum_{n=0}^{\infty} \frac{x^{5n}}{n!}$

16. $\sum_{n=0}^{\infty} \frac{(3x)^n}{(2n)!}$

17. $\sum_{n=0}^{\infty} (2n)!\left(\frac{x}{3}\right)^n$

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

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

20. $\sum_{n=0}^{\infty} \frac{(-1)^n n!(x-5)^n}{3^n}$

For the remaining problems, individually check endpoint convergence.

21. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-4)^n}{n*9^n}$

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

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

24. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-2)^{n}}{n*2^{n}}$

AP Calculus BC

10.8 Worksheet day 2

1. Given the series $f(x) = \sum_{n=0}^{\infty} \left(\frac{x}{3}\right)^n$, find each of the following series and also the intervals of convergence for each:

(a) $f(x)$

(b) $f'(x)$

(c) $\int f(x)dx$

2. Given the series $f(x) = \sum_{n=0}^{\infty} \frac{(-1)^{n+1}(x-1)^{n+1}}{n+1}$, find each of the following series and also the intervals of convergence for each:

(a) $f(x)$

(b) $f'(x)$

(c) $\int f(x)dx$

AP Calculus BC

10.9 Worksheet

Find the geometric power series for the function, centered at 0.

1. $f(x) = \frac{1}{4-x}$

2. $f(x) = \frac{1}{2+x}$

3. $f(x) = \frac{4}{3+x}$

4. $f(x) = \frac{2}{5-x}$

Find a power series for the function, centered at c, and determine the interval of convergence.

5. $f(x) = \frac{1}{3-x}$, $c = 1$

6. $f(x) = \frac{2}{6-x}$, $c = -2$

7. $f(x) = \frac{1}{1-3x}$, $c = 0$

8. $h(x) = \frac{1}{1-5x}$, $c = 0$

9. $f(x) = \frac{2}{1-x^2}$, $c = 0$

10. $f(x) = \frac{5}{5+x^2}$, $c = 0$

Find the power series for the function, centered at 0, and determine the interval for convergence.

11. $h(x) = -\frac{2}{x^2-1} = \frac{1}{1+x} + \frac{1}{1-x}$

12. $f(x) = -\frac{1}{(x+1)^2} = \frac{d}{dx}\left[\frac{1}{x+1}\right]$

13. $g(x) = \frac{1}{x^2+1}$

Use the series for arctan to approximate the value using $R_N \leq 0.001$.

14. arctan(¼)

Find a power series for the function, centered at 0, and determine the interval of convergence.

15. $f(x) = \frac{1}{(1-x)^2}$

Find the sum of the convergent series by using a well-known function. Identify the function and explain how you obtained the sum.

16. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2^n * n}$

17. $\sum_{n=0}^{\infty} (-1)^n * \frac{1}{2^{2n+1}(2n+1)}$

AP Calculus BC Name: ________________________________

10.10 Worksheet Period: ____________

Find the Taylor Series, centered at c, for the function.

1. $f(x) = \frac{1}{x}$, $c = 1$

2. $f(x) = \frac{1}{1-x}$, $c = 2$

Use the binomial series to find the Maclaurin Series for the function.

3. $f(x) = \sqrt[4]{1+x}$

4. $f(x) = \sqrt{1 + x^7}$

Find the Maclaurin Series for the function. Use the list of power series for elementary functions (in your notes!).

5. $f(x) = e^{x^2/2}$

6. $g(x) = e^{-3x}$

7. $f(x) = \ln(1 + x)$

8. $f(x) = \ln(1 + x^2)$

9. $f(x) = \cos(4x)$

10. $f(x) = \cos(\pi x)$

11. $f(x) = 3 + 4e^{x^3}$

12. $f(x) = \cos^2(x)$

Calculus 2 - Unit 10 Part 2 REVIEW

Find the Maclaurin series for the given function (use the elementary forms table):

1) $g(x)=\dfrac{1}{x^5}$

2) $g(x)=\sin\left(2-x^3\right)$

3) $g(x)=\dfrac{1}{3+x^2}$

Writing first 5 terms of a power expansion for the given function (use the elementary forms table):

4) $f(x)=\cos\left(3x^5\right)$

5) $f(x)=\sin(4x-3)$

Find the specified Maclaurin or Taylor polynomial (for these you must use the definitions):

6) Find the *n* = 5 Maclaurin polynomial for the function $f(x)=\sin(3x)$

7) Find the *n* = 4 Taylor polynomial centered at c = 2 for the function $f(x)=\ln(x)$

8) Find the *n* = 4 Maclaurin polynomial for the function $f(x)=xe^x$

9) Find the *n* = 4 Taylor polynomial centered at c = 9 for the function $f(x)=\sqrt{x}$

10) Find the *n* = 5 Maclaurin polynomial for the function $f(x)=e^{3x}$

11) Determine the degree of the Maclaurin polynomial centered at 0 required to approximate $f(0.4)$ for the function $f(x)=\sin(x)$ for the error to be less than 0.0002.

12) Determine the degree of the Maclaurin polynomial centered at 1 required to approximate $f(1.4)$ for the function $f(x)=\ln(x)$ for the error to be less than 0.0002.

13) Determine the degree of the Maclaurin polynomial centered at 0 required to approximate $f(0.7)$ for the function $f(x)=e^x$ for the error to be less than 0.0004.

14) Find the interval of convergence of the series $\sum_{n=1}^{\infty} \frac{x^{2n}}{(2n)!}$ (consider the endpoints).

15) Find the interval of convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(x-4)^n}{n9^n}$ (consider the endpoints).

16) Find the interval of convergence of the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{(x-1)^{n+1}}{n+1}$ (consider the endpoints).

17) If $f(x) = \sum_{n=1}^{\infty} \frac{x^{2n}}{2n+1}$ find the interval of convergence for (a) $f(x)$ (b) $f'(x)$ (c) $\int f(x)\,dx$