

Name _____ Date _____ Period _____

Worksheet 9.3—Power Series: Taylor and Maclaurin Series

Show all work. No calculator except unless specifically stated.

On problems 1-3, find a Taylor series for $f(x)$ centered at the given value of a . Give the first four nonzero terms and the general term for each series.

1. $f(x) = e^{2x}$, $a = 3$

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

3. $f(x) = \ln x$, $a = 1$

On problems 4-5, find a Taylor series for $f(x)$ centered at the given value of a . Give the first four nonzero terms.

4. $f(x) = \sin x$, $a = \frac{\pi}{6}$

5. $f(x) = \cos x$, $a = -\frac{\pi}{4}$

On problems 6-10, find a Maclaurin series for $f(x)$. Give the first four nonzero terms and the general term for each series. Hint: Don't reinvent the wheel (or the series), rather, modify an existing power series.

6. $f(x) = e^{\frac{-x}{2}}$ 7. $f(x) = \sin(x^2)$ 8. $f(x) = \frac{\cos(3x)}{x}$ 9. $f(x) = x^2 e^{-x}$

10. $f(x) = \sin^2 x$ (ADDITIONAL HINT: use the power-reducing identity)

11. (Calculator Permitted) Use your answer for problem 7 to approximate $\int_0^1 \sin(x^2) dx$ correct to three decimal places.
12. (a) Find the first four nonzero terms in the Taylor series expansion about (centered at) $x = 0$ for $f(x) = \sqrt{1+x}$.
- (b) Use the results found in part (a) to find the first four nonzero terms in the Taylor series expansion about $x = 0$ for $g(x) = \sqrt{1+x^3}$.
- (c) Find the first four nonzero terms in the Taylor series expansion about $x = 0$ for the function h such that $h'(x) = \sqrt{1+x^3}$ and $h(0) = 4$.

13. Let f be the function defined by $f(x) = \frac{1}{x-1}$.

(a) Write the first four terms and the general term of the Taylor series expansion of $f(x)$ about $x = 2$.

(b) Use the result from part (a) to find the first four terms and the general term of the series expansion about $x = 2$ for $\ln|x-1|$