

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**Worksheet 10b 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.  $f(x) = x^2 e^{-x}$

(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  $\ln|x-1|$