

NAME(print in CAPITAL letters, first name first): \_\_\_\_\_

NAME(sign): \_\_\_\_\_

ID#: \_\_\_\_\_

**Instructions:** There are six problems. Make sure that you have all 6 problems.

Points received:

\_\_\_\_\_  
1 \_\_\_\_\_

\_\_\_\_\_  
2 \_\_\_\_\_

\_\_\_\_\_  
3 \_\_\_\_\_

\_\_\_\_\_  
4 \_\_\_\_\_

\_\_\_\_\_  
5 \_\_\_\_\_

\_\_\_\_\_  
6 \_\_\_\_\_

TOTAL \_\_\_\_\_

1. (24 points.) Suppose that  $|x| < 1$ . Find the sum of the series

$$1 + 2x + 3x^2 + 4x^3 + 5x^4 + \dots$$

2. (24 points.) Use series to estimate the following integrals to within  $10^{-8}$ .

(a)  $\int_0^{0.1} \sin x^2 dx$

(b)  $\int_0^{0.1} e^{-x^2} dx$

3. (24 points.)

(a) Find the Maclaurin polynomial of order 6 for  $e^{-x}$ .

(b) Use your answer from part (a) to estimate  $1/e$ .

(c) Find an upper bound for the error of your estimate in part (b). Use the alternating series approximation.

4. (24 points.) Let  $f(x) = x^2 e^{x^2}$ .

(a) Find the MacLauren series for  $f(x)$ .

(b) Find  $f^{(7)}(0)$ .

(c) Find  $f^{(8)}(0)$ .

(d) Find  $f^{(9)}(0)$ .

5. (24 points.) Consider the plane that passes through the points  $(0, 1, 0)$ ,  $(1, 2, 0)$ , and  $(0, 2, 1)$ .

(a) Find a vector normal to the plane.

(b) Find an equation for the plane.

6. (12 points.) Find parametric equations for the line containing  $(0, 2, 0)$  and  $(1, 3, 5)$ .