

Name: \_\_\_\_\_

1. Which of the following are power series?

(a)  $3 + x + 4x^2 + x^3 + 5x^4 + 9x^5 + 2x^6 + \dots$

(b)  $\sum_{n=1}^{\infty} \frac{\tan(x^n)}{n!}$

(c)  $x + x^2 + x^4 + x^8 + x^{16} + x^{32} + \dots$

2. True or false: if  $a_n > 0$  and  $\sum a_n$  converges, then  $\sum (-1)^{n-1} a_n$  converges.

3. Apply Euler's method to the differential equation  $\frac{dy}{dx} = -2y$  with initial value  $y(0) = 1$ , and with step size  $h = 1$ .

$x_0$  :

$y_0$  :

$x_1$  :

$y_1$  :

$x_2$  :

$y_2$  :

$x_3$  :

$y_3$  :

$x_n$  :

$y_n$  :

4. Calculate the interval of convergence of

$$\frac{x}{1} - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} + \cdots$$

5. Suppose that  $f'(x) = 3x^2 f(x)$ ,  $f(0) = 1$ , and  $f(t) = 5$ . What is  $t$ ?

6. **Challenge Problem:** suppose  $f(x)$  is differentiable on the interval  $(-\infty, \infty)$ . Show that there is a number  $a$  such that  $f'(a) \neq e^{f(a)}$ .