

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

1. Fill in the blanks (short answers).

(a) True or False: If  $g(x)$  is differentiable at  $a$  and  $f(x)$  is differentiable at  $g(a)$ , then  $f(g(x))$  is differentiable at  $a$ .

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(b) If  $f(x)$  is an odd function, then  $\int_{-c}^c f(x) dx =$  \_\_\_\_\_.

(c) A function  $y = f(x)$  is defined to be continuous at a point  $a$  if \_\_\_\_\_.

(d) True or False: The intermediate value theorem guarantees that the equation  $2x^3 + x^2 + 2 = 0$  has a solution in the interval  $[-2,1]$ . \_\_\_\_\_

2. Evaluate the following limits.

$$(a) \lim_{x \rightarrow \infty} \sin\left(\frac{2x}{x^2}\right)$$

$$(b) \lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 + 3x + 2}$$

$$(c) \lim_{t \rightarrow 16} \frac{4 - \sqrt{t}}{t - 16}$$

3. The volume of a cube is increasing at  $10 \text{ cm}^3$ . How fast is the surface of the cube increasing when the edge length of the cube is  $30 \text{ cm}$ ?

4. A rectangular piece of paper is to contain 24 square inches of print. The top and bottom margins are 1.5 inches and the left and right margins are 1 inch. What are the dimensions of the page that uses the least amount of paper?

5. Find  $f(x)$  if  $f'(x) = \frac{x^2 + \sqrt{x}}{x}$  and  $f(1) = 3$ .

6. Evaluate the following integrals.

(a)  $\int \frac{1 + \sqrt{x}}{x^2} dx$

$$(b) \int \frac{-4x}{(1-2x^2)^2} dx$$

$$(c) \int_0^{\pi/2} \cos\left(\frac{2x}{3}\right) dx$$

7. Determine the area bound by the curves  $y = 2 - x^2$  and  $y = x$ .

8. Find the volume of the solid obtained by rotating the region bound by the graphs of  $y = \sqrt{x}$  and  $y = x^2$  about the  $x$ -axis.