Name: _____

Calculus 1: Review (Test 1)

1. Compute the following limit.

$$\lim_{x \to 5} \left(2x^2 + 5x + 2\right)$$

2. Compute the following limit.

$$\lim_{x \to 5} \frac{x^2 - 10x + 25}{x - 5}$$

3. Compute the following limit.

$$\lim_{x \to 9} \frac{x^2 - 81}{x - 9}$$

4. Compute the following limit.

$$\lim_{x \to 49} \frac{x - 49}{\sqrt{x} - 7}$$

5. Compute the following limit.

$$\lim_{x \to 21} \frac{\sqrt{x - 5} - 4}{x - 21}$$

6. Compute the following limit.

$$\lim_{x \to 13} \frac{\sqrt{x - 9} - 2}{x - 13}$$

7. Compute the following limit.

$$\lim_{x \to 3} \frac{x^3 - 3x^2 - x + 3}{x - 3}$$

8. Compute the following limit.

$$\lim_{x \to 3} \frac{x^3 - 2x^2 - 5x + 6}{x - 3}$$

9. Compute the following limit.

$$\lim_{x \to 0} \left| x^2 - x + 5 \right|$$

10. Compute the following limit.

$$\lim_{x \to 4} \left| \frac{x^3 - 64}{x - 4} \right|$$

11. Compute the limit of the difference quotient

$$\lim_{x \to t} \frac{f(x) - f(t)}{x - t}$$

when $f(x) = 12x + 11$ and $t = 5$.

12. Compute the limit of the difference quotient

$$\lim_{x \to t} \frac{f(x) - f(t)}{x - t}$$

when $f(x) = 3x^2 + 2x + 6$ and $t = 10$.

13. Compute the limit of the difference quotient

$$\lim_{x \to t} \frac{f(x) - f(t)}{x - t}$$

when $f(x) = \sqrt{x + 4}$ and $t = 4$.

14. Compute the following limit.

$$\lim_{x \to 0} \frac{\sin(9x)}{x}$$

15. Compute the following limit.

$$\lim_{x \to 0} \frac{4x^2 + 10x + \sin x}{x}$$

16. Let $f(x)$ be the function

$$f(x) = \begin{cases} \frac{x-b}{b+7} & \text{if } x < 0 \\ \\ x^2 + b & \text{if } x \geq 0. \end{cases}$$

Find the value(s) of the constant b such that $f(x)$ is continuous everywhere.

17. Compute the following derivative.

$$\frac{d}{dx}\left(15x^2 + 4x + 6\right)$$

18. Compute the derivative of the following function of t.

$$f(t) = \frac{9}{t^3} + \frac{6}{t} + 6t^4.$$

19. Let $f(x) = x + \frac{6}{x}$.

    (a) Compute the derivative of f.
    (b) Find an equation for the line tangent to f at the point $(3, 5)$.

20. Compute the derivative of the following function.

$$f(x) = \frac{x^2 + 2x + 2}{6x - 8}$$

21. Find the values of x at which the line tangent to

$$f(x) = x^3 + 5x^2 + 10x + 77$$

    is horizontal.