Part I. Determine whether the statement is true or false:

1. \( f(x) \) must be defined at \( a \) in order for the limit of \( f \) to exist at \( a \).
2. \( f(x) \) must be defined at \( a \) in order for \( f(x) \) to be continuous at \( a \).
3. The limit exists if and only if both left limit and right limit exist.
4. If \( f(x) \) is continuous at \( a \), then \( \lim_{x \to a} f(x) \) exists.
5. If \( \lim_{x \to 0} f(x) = 2 \) and \( \lim_{x \to 0} g(x) = 0 \), then \( \lim_{x \to 0} \frac{f(x)}{g(x)} \) doesn’t exist.
6. If \( \lim_{x \to 6} f(x)g(x) \) exists, then \( \lim_{x \to 6} f(x)g(x) = f(6)g(6) \).
7. If \( f(1) < 0 \) and \( f(3) > 0 \), then there exists a number \( c \) between 1 and 3 such that \( f(c) = 0 \).
8. If \( f(x) \) is continuous on \([-1, 1]\) and \( f(-1) = 4, f(1) = 3 \), then there is a number \( c \) such that \( |c| < 1 \) and \( f(c) = \pi \).
9. If \( f(x) \) is continuous at 4 and \( f(4) = 2 \), then \( \lim_{x \to 2} f(4x^2 - 12) = 2 \).
10. If \( f \) is continuous at \( a \), then \( f \) is differentiable at \( a \).
11. If \( f \) is differentiable at \( a \), then \( f \) is continuous at \( a \).
12. If \( f' \) exists, then \( \lim_{x \to a} f(x) = f(a) \).
13. If \( f'(a) \) exists, then \( \lim_{x \to a} f(x) = f(a) \).
14. An equation of the tangent line to the parabola \( y = x^2 \) at \((-2, 4)\) is \( y - 4 = 2x(x + 2) \).
15. If \( f \) and \( g \) are differentiable, then \[ \left[f(x)g(x)\right]' = f'(x)g'(x) \] .
16. If \( f \) is differentiable, then \[ \frac{d}{dx} \sqrt{f(x)} = \frac{f'(x)}{2\sqrt{f(x)}} \] .
17. If \( y = e^x \), then \( y' = 2e \).
18. \[ \frac{d}{dx}(10^x) = x10^{x-1} \] .
19. \[ \frac{d}{dx}(\ln 10) = \frac{1}{10} \] .
20. If \( g(x) = x^5 \), then \( \lim_{x \to 2} \frac{g(x) - g(2)}{x - 2} = 80 \) .
21. \[ \frac{d}{dx} \ln |x| = \frac{1}{|x|} \] .

Part II. Show your work.

1. All homework assignments.
3. Chapter 3 Review Exercises, p232: 3, 14, 16, 19, 23, 27, 31, 35, 39, 43,