

Gateway Exam #2 Practice Problems
The Definition of the Derivative

1. Assuming that the function f is differentiable at 5, which of the following must be equal to $f'(5)$?

(a) $\lim_{x \rightarrow 0} \frac{f(x) - f(5)}{x - 5}$

(b) $\lim_{x \rightarrow 5} \frac{f(x) - f(5)}{x}$

(c) $\lim_{h \rightarrow 0} \frac{f(5+h) - f(5)}{h-5}$

(d) $\lim_{h \rightarrow 5} \frac{f(5+h) - f(5)}{h}$

(e) $\lim_{x \rightarrow 5} \frac{f(x) - f(5)}{x-5}$

2. Assuming that the function g is differentiable at -2, which of the following must be equal to $g'(-2)$?

(a) $\lim_{x \rightarrow 0} \frac{f(x) - f(-2)}{x+2}$

(b) $\lim_{x \rightarrow -2} \frac{f(x) - f(-2)}{x}$

(c) $\lim_{h \rightarrow 0} \frac{f(-2+h) - f(-2)}{h}$

(d) $\lim_{h \rightarrow 0} \frac{f(-2+h) - f(-2)}{h+2}$

(e) $\lim_{h \rightarrow -2} \frac{f(-2+h) - f(-2)}{h}$

3. Assuming that the function f is differentiable at 8, which of the following must be equal to $f'(8)$?

(a) $\lim_{t \rightarrow 0} \frac{f(t) - f(8)}{t-8}$

(b) $\lim_{t \rightarrow 8} \frac{f(t) - f(8)}{t-8}$

(c) $\lim_{t \rightarrow 8} \frac{f(t) - f(8)}{t}$

(d) $\lim_{h \rightarrow 0} \frac{f(8+h) - f(8)}{h-8}$

(e) $\lim_{h \rightarrow 8} \frac{f(8+h) - f(8)}{h}$

4. Assuming that the function g is differentiable at a , which of the following must be equal to $g'(a)$?

(a) $\lim_{x \rightarrow 0} \frac{g(x) - g(a)}{x-a}$

(b) $\lim_{x \rightarrow a} \frac{g(x) - g(a)}{x}$

(c) $\lim_{h \rightarrow 0} \frac{g(a+h) - g(a)}{h-a}$

(d) $\lim_{x \rightarrow a} \frac{g(x) - g(a)}{x-a}$

(e) $\lim_{h \rightarrow a} \frac{g(a+h) - g(a)}{h}$

5. Assuming that the function f is differentiable at 4, which of the following must be equal to $f'(4)$?

(a) $\lim_{\Delta x \rightarrow 0} \frac{f(4+\Delta x) - f(4)}{\Delta x}$

(b) $\lim_{x \rightarrow 0} \frac{f(x) - f(4)}{x-4}$

- (c) $\lim_{x \rightarrow 4} \frac{f(x) - f(4)}{x}$
- (d) $\lim_{\Delta x \rightarrow 0} \frac{f(4 + \Delta x) - f(4)}{\Delta x - 4}$
- (e) $\lim_{\Delta x \rightarrow 4} \frac{f(4 + \Delta x) - f(4)}{\Delta x}$

6. Suppose that $\lim_{x \rightarrow 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2} = f'(a)$ for some function f and some number a . Which of the following could be f and a ?

- (a) $f(x) = \sqrt{x}$, $a = \sqrt{2}$
- (b) $f(x) = \sqrt{x}$, $a = 2$
- (c) $f(x) = x - 2$, $a = 2$
- (d) $f(x) = \sqrt{x} - \sqrt{2}$, $a = 0$
- (e) $f(x) = \sqrt{x - 2}$, $a = 2$

7. Suppose that $\lim_{h \rightarrow 0} \frac{(-4+h)^2 - 16}{h} = f'(a)$ for some function f and some number a . Which of the following could be f and a ?

- (a) $f(x) = (-4 + x)^2$, $a = 4$
- (b) $f(x) = x^2$, $a = -4$
- (c) $f(x) = x^2$, $a = 0$
- (d) $f(x) = x^2 - 16$, $a = 0$
- (e) $f(x) = x^2$, $a = 4$

8. Suppose that $\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3} = f'(a)$ for some function f and some number a . Which of the following could be f and a ?

- (a) $f(x) = x^3$, $a = 27$
- (b) $f(x) = x^3 - 27$, $a = 0$
- (c) $f(x) = x^3 + 1$, $a = 3$
- (d) $f(x) = x - 3$, $a = 27$
- (e) $f(x) = (x - 3)^3$, $a = -3$

9. Suppose that $\lim_{h \rightarrow 0} \frac{(7+h)^{-1} - 7^{-1}}{h} = f'(a)$ for some function f and some number a . Which of the following could be f and a ?

- (a) $f(x) = (7 + x)^{-1}$, $a = 7$
- (b) $f(x) = x^{-1}$, $a = 0$
- (c) $f(x) = x$, $a = 7$
- (d) $f(x) = 7 + x$, $a = 0$
- (e) $f(x) = x^{-1}$, $a = 7$

10. Suppose that $\lim_{x \rightarrow 0} \frac{|x-5|-5}{x} = f'(a)$ for some function f and some number a . Which of the following could be f and a ?

- (a) $f(x) = |x|$, $a = 0$

(b) $f(x) = |x - 5|$, $a = 5$

(c) $f(x) = x - 5$, $a = 0$

(d) $f(x) = |x - 5|$, $a = 0$

(e) $f(x) = |x|$, $a = 5$

Answers:

1. e

2. c

3. b

4. d

5. a

6. b

7. b

8. c

9. e

10. d