

AP Calculus I
Derivatives as Limits Practice

Name ANSWERS

Date _____

Evaluate each limit as a derivative. Do not use a calculator.

1. $\lim_{n \rightarrow 0} \frac{(-\frac{2}{5} + n)^2 - \frac{4}{25}}{n}$ is

- a) $-\frac{4}{5}$
- b) $\frac{5}{2}$
- c) $\frac{2}{5}$
- d) $\frac{4}{5}$
- e) no limit

1. $x = -2/5; f(x) = x^2$

3. $\lim_{x \rightarrow 64} \frac{x^{\frac{1}{3}} - 4}{x - 64} =$

- a) $\frac{1}{4}$
- b) $\frac{1}{16}$
- c) $\frac{1}{48}$
- d) $\frac{1}{8}$
- e) 16

3. $x = 64; f(x) = x^{1/3}$

5. $\lim_{n \rightarrow 0} \frac{10^{n+0} - 1}{n}$ is $\lim_{n \rightarrow 0} \frac{f(x+n) - f(x)}{n}$

- a) 1
- b) 0
- c) $\ln 10$
- d) $\log 1$
- e) e

5. $x = 0; f(x) = 10^x$
 $f'(x) = 10^x \ln 10$

7. $\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4} =$

- a) 0
- b) $-\frac{1}{4}$
- c) $\frac{1}{4}$
- d) $\frac{1}{2}$
- e) undefined

7. $x = 4; f(x) = \sqrt{x}$

9. What is $\lim_{h \rightarrow 0} \frac{\sqrt{9+h} - \sqrt{9}}{h}$?

- a) $\frac{1}{18}$
- b) $\frac{1}{6}$
- c) 6
- d) 18
- e) $\frac{1}{2\sqrt{9+h}}$

9. $x = 9; f(x) = \sqrt{x}$

11. What is $\lim_{h \rightarrow 0} \frac{\cos(\frac{\pi}{6} + h) - \cos(\frac{\pi}{6})}{h}$?

- a) 0
- b) $-\frac{1}{2}$
- c) $\frac{1}{2}$
- d) $\frac{\sqrt{3}}{2}$
- e) $-\frac{\sqrt{3}}{2}$

11. $x = \pi/6; f(x) = \cos x$

2. What is $\lim_{h \rightarrow 0} \frac{\sqrt[3]{27+h} - \sqrt[3]{27}}{h}$?

- a) $\frac{1}{27}$
- b) $\frac{1}{9}$
- c) $\frac{1}{81}$
- d) $\frac{1}{3}$
- e) 0

2. $x = 27; f(x) = \sqrt[3]{x}$

4. $\lim_{x \rightarrow 1} \frac{\ln x - 0}{x - 1}$ is $\frac{f(x) - f(c)}{x - c}$

- a) 1
- b) ∞
- c) -1
- d) $\ln 2$
- e) e

4. $x = 1; f(x) = \ln x$

6. $\lim_{h \rightarrow 0} \frac{e^{2(x+h)} - e^{2x}}{h}$ is Chain

- a) 1
- b) 0
- c) $2e$
- d) $2e^x$
- e) e^2

6. $x = x; f(x) = e^{2x}$

8. What is $\lim_{h \rightarrow 0} \frac{(4+h)^3 - 4^3}{h}$?

- a) $8h$
- b) 16
- c) 48
- d) 64
- e) 8

8. $x = 4; f(x) = x^3$

10. What is $\lim_{h \rightarrow 0} \frac{\sin(\frac{\pi}{3} + h) - \sin(\frac{\pi}{3})}{h}$?

- a) 0
- b) $-\frac{1}{2}$
- c) $\frac{1}{2}$
- d) $\frac{\sqrt{3}}{2}$
- e) $-\frac{\sqrt{3}}{2}$

10. $x = \pi/3; f(x) = \sin x$

12. $\lim_{x \rightarrow 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3} =$

- a) 0
- b) $-\frac{1}{9}$
- c) $\frac{1}{27}$
- d) $\frac{1}{9}$
- e) $\frac{1}{3}$

12. $x = 3; f(x) = \frac{1}{x}$