

Midterm 2 Practice Problem Set 1

1. The average cup (8oz) of coffee has 95 mg of caffeine and has a half-life of about 5 hours (dependent on the individual's metabolism). If we ignore extraneous factors, we can model this phenomenon using exponential decay. According to this model, what amount of caffeine remains in the body after t hours?

(a) $P(t) = 8e^{-\frac{\ln(2)}{5}t}$ (c) $P(t) = 5e^{-\frac{\ln(2)}{95}t}$
(b) $P(t) = 95e^{-\frac{\ln(2)}{5}t}$ (d) $P(t) = 8e^{-\frac{\ln(2)}{95}t}$

2. Find the limit of the following sequence $\{a_n\}$,

$$a_n = 2(-1)^n$$

(a) 2 (c) 0
(b) -2 (d) Does not exist.

3. Determine whether or not a function exists with the following conditions:

$$\lim_{s \rightarrow 0^+} q(s) = 7 \text{ and } \lim_{s \rightarrow 0} q(s) = 3$$

(a) Exists. (b) Does not exist.

For questions 4-9, use the following information:

$$\lim_{x \rightarrow 2} f(x) = 2 \text{ and } \lim_{x \rightarrow 2} g(x) = 0 \text{ and } \lim_{x \rightarrow 2} h(x) = 16$$

4. Compute:

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

(a) 8 (c) 0
(b) 2 (d) DNE

5. Compute:

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

(a) 0 (c) $\frac{1}{2}$
(b) 2 (d) DNE

6. Compute:

$$\lim_{x \rightarrow 2} \sqrt{h(x)}f(x)$$

(a) 8 (c) 4
(b) 32 (d) DNE

7. Compute:

$$\lim_{x \rightarrow 2} 5f(x)$$

(a) 0 (c) 40
(b) 10 (d) DNE

8. Compute:

$$\lim_{x \rightarrow 2} \frac{\sqrt[4]{h(x)}}{f(x)}$$

(a) 1 (c) $\sqrt[4]{8}$
(b) 2 (d) DNE

9. Compute:

$$\lim_{x \rightarrow 2} f(x)g(x)h(x)$$

(a) 1 (c) 0
(b) 32 (d) DNE

10. If a function h is continuous at a point c , then h is differentiable at c .

- (a) True. (b) False.

11. Compute the following:

$$\frac{d}{dk} [\ln(k^2)]$$

- (a) $2 \ln(k)$ (c) $\frac{2}{k^2}$
(b) $\frac{1}{\ln(k^2)}$ (d) $\frac{2}{k}$

12. Find the limit, if it exists:

$$\lim_{a \rightarrow 2} \frac{a^2 - 4}{a - 2}$$

- (a) 3 (c) 0
(b) 4 (d) Does not exist.

13. Find the limit, if it exists:

$$\lim_{m \rightarrow 0} \frac{\sqrt{m + 49} - 7}{m}$$

- (a) $\frac{1}{14}$ (c) $\frac{1}{7}$
(b) 7 (d) Does not exist.

14. Let g be a function and suppose that $g(a) = -5$ and $g(b) = 0$. Does there exist a number c between a and b such that $g(c) = -2$?

- (a) True. (b) False.

15. For what value(s) c is the function p continuous?

$$p(z) = \begin{cases} cz^2 & z \geq 1 \\ z + 4 & z < 1 \end{cases}$$

- (a) 5 (c) 4
(b) 1 (d) No such value exists.

16. Find $\frac{dy}{dx}$ for the following implicit equation:

$$xy = 1$$

- (a) $\frac{dy}{dx} = \frac{y}{x}$ (c) $\frac{dy}{dx} = -\frac{y}{x}$
(b) $\frac{dy}{dx} = \frac{x}{y}$ (d) $\frac{dy}{dx} = -\frac{x}{y}$

