

Unit 1 Exam

Recommended amount of time: 1 hour 30 mins

- Topics covered on this exam:
 - Methods of evaluating limits
 - Determining limits from graphs
 - Limits at infinity
 - Continuity on an interval and at a point
 - The limit definition of the derivative
- This exam is composed of 20 multiple choice questions and 2 free response questions
- Calculators are allowed for computation use only (addition, division, square root, exponents, etc.)
- For the free response section, show all of your work (think about partial credit on an actual test)
- When you are finished with the test, see which questions you got wrong and review those questions

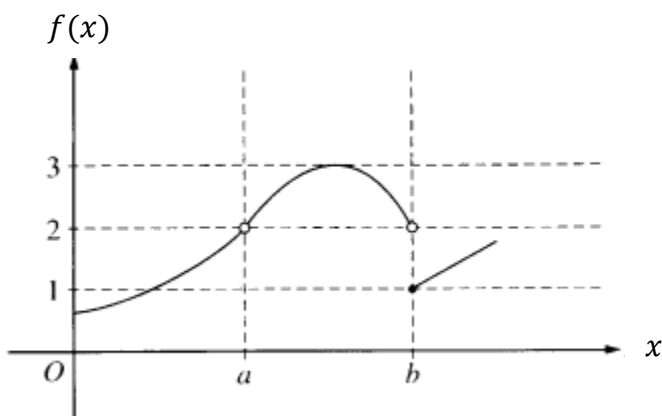


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1. $\lim_{x \rightarrow \infty} \frac{6x^2 - 2x + 1}{4x^3 - 24x^2 - 2x}$ is

- (A) 0 (B) $\frac{1}{4}$ (C) $\frac{3}{2}$ (D) ∞ (E) nonexistent



2. The graph of the function $f(x)$ is shown in the figure above. Which of the following statements about $f(x)$ is true?

- (A) $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow b} f(x)$
(B) $\lim_{x \rightarrow a} f(x) = 2$
(C) $\lim_{x \rightarrow b} f(x) = 2$
(D) $\lim_{x \rightarrow b} f(x) = 1$
(E) $\lim_{x \rightarrow a} f(x)$ does not exist

3. If the function f is continuous for all real numbers and if $f(x) = \frac{x^2 - 9}{x + 3}$ when $x \neq -3$, then $f(-3) =$

- (A) -6 (B) -7 (C) 6 (D) 0 (E) Does Not Exist

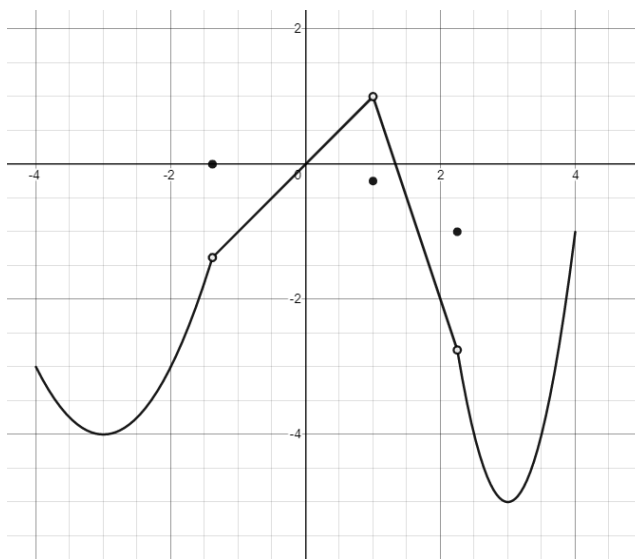
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4. If $f(x) = e^x$, which of the following is equal to $f'(e)$?

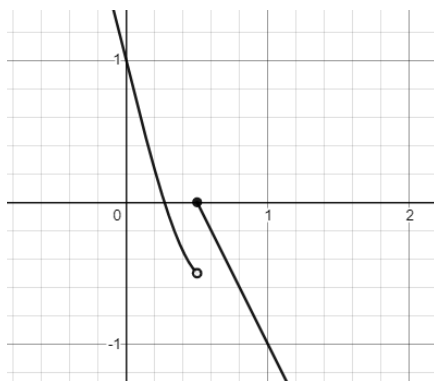
- (A) $\lim_{h \rightarrow 0} \frac{e^{x+h}}{h}$ (B) $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^e}{h}$ (C) $\lim_{h \rightarrow 0} \frac{e^{e+h} - e}{h}$
(D) $\lim_{h \rightarrow 0} \frac{e^{x+h} - 1}{h}$ (E) $\lim_{h \rightarrow 0} \frac{e^{e+h} - e^e}{h}$

The following graph will be used to answer questions 5-10



5. What is $\lim_{x \rightarrow -1.38} f(x)$
(A) -2.75 (B) -1.38 (C) -1 (D) 0 (E) DNE
6. What is $\lim_{x \rightarrow 1} f(x)$
(A) -1.38 (B) -0.25 (C) 0 (D) 1 (E) DNE
7. What is $\lim_{x \rightarrow 2.25} f(x)$
(A) -2.75 (B) -1.38 (C) -1 (D) 1 (E) DNE
8. What is $f(-1.38)$
(A) -2.75 (B) -1.38 (C) -1 (D) 0 (E) DNE
9. What is $f(1)$
(A) -2.75 (B) -0.25 (C) 0 (D) 1 (E) DNE
10. What is $f(2.25)$
(A) -2.75 (B) -1.38 (C) -1 (D) 0 (E) DNE

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11. The graph of function $f(x)$ is shown in the figure above. Which of the following statements are true about $f(x)$?

- I. $\lim_{x \rightarrow 0.5^-} f(x) = -0.5$
- II. $\lim_{x \rightarrow 0.5^+} f(x) = 0$
- III. $f(x)$ is continuous over the bounds $0 < x < 1$

- (A) I only
- (B) II only
- (C) I and II
- (D) II and III
- (E) I, II, and III

12. $\lim_{x \rightarrow 0} \frac{\cos^2(x) - 2 \cos(x) + 1}{x^2}$ is

- (A) 1 (B) 0 (C) -1 (D) π (E) Does Not Exist

13. $\lim_{x \rightarrow 0} \frac{\tan(x) - 4x + \cos(x)}{\sin(x) - \cos(x)}$ is

- (A) 1 (B) 0 (C) -1 (D) π (E) Does Not Exist

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14. $\lim_{x \rightarrow -5} \frac{\sqrt{x^2 - 16} - 3}{x + 5}$ is

- (A) $\frac{5}{3}$ (B) $\frac{-5}{3}$ (C) -10 (D) 0 (E) Does Not Exist

15. $\lim_{x \rightarrow 3} \frac{\sqrt{x^2 - 16} - 3}{x - 5}$ is

- (A) $\frac{5}{3}$ (B) $\frac{-5}{3}$ (C) -10 (D) 0 (E) Does Not Exist

16. $\lim_{x \rightarrow -4} \frac{x^3 + 2x^2 - 8x}{x + 4}$ is

- (A) 0 (B) -24 (C) 24 (D) 12 (E) Does Not Exist

17. $\lim_{x \rightarrow 0} \frac{(x+4)(x-6)}{x^2}$ is

- (A) 0 (B) -2 (C) -1 (D) 1 (E) Does Not Exist

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18. $\lim_{x \rightarrow \infty} \frac{4x+4}{\sqrt{16x^2+x-7}}$ is

- (A) 0 (B) 1 (C) -1 (D) 1/2 (E) Does Not Exist

19. Find the horizontal asymptote (if any) for the function $f(x) = \frac{\sqrt{4x^4-1}}{2x^2+6}$

- (A) 0 (B) 1 (C) -1 (D) 1/2 (E) No asymptotes exist

20. Find the horizontal asymptotes (if any) for the function $f(x) = \begin{cases} \frac{2x^2-x-6}{x-2} & \text{for } x > 2 \\ \frac{x-2}{2x^2-x-6} & \text{for } x \leq 2 \end{cases}$

- (A) 0 (B) 1 (C) 0 and 2 (D) 1 and -2 (E) No asymptotes exist

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Free Response

1. Is $f(x)$ continuous at the point $x = 1$ if

$$f(x) = \begin{cases} x^2 + 1, & x > 1 \\ 3, & x = 1 \\ -2x + 4, & x < 1 \end{cases}$$

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Dan the Tutor



Learn by Doing

2. Find the slope of $f(x) = x^2 + 2x$ using the limit definition of a derivative. Show all work.