



*University of Connecticut*  
*Department of Mathematics*

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MATH 1131

PRACTICE PROBLEMS FOR EXAM 1

**Sections Covered:** 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 3.1

**Read This First!**

- Please arrive early and bring a pencil and eraser.
- Please read each question carefully. All questions are multiple choice. There is only one correct choice for each answer.
- On the exam, indicate your answers on the answer sheet. The answer sheet is the **ONLY** place that counts as your official answers.
- **Calculators are NOT allowed** on the exam. No books or other references or electronic devices are permitted.

1. The distance traveled by a particle in  $t$  seconds is given by  $s(t) = t^2 + 3t$ . What is the particle's average velocity over the interval  $1 \leq t \leq 4$ ? [1]

(A) 8      (B) 0      (C) 2  
(D) 5      (E) -1

2. Evaluate the following limit: [1]

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

(A) 2      (B) -2      (C) -1  
(D)  $+\infty$       (E)  $-\infty$

3. Using the table below, what appears to be the value of the limit

[1]

$$\lim_{x \rightarrow 2^+} f(x)$$

$x$	1.9	1.99	1.999	1.9999	2	2.0001	2.001	2.01	2.1
$f(x)$	3	7	291	4081	?	-9532	-112	-17	-1

- (A)  $\infty$       (B)  $-\infty$       (C) 0  
(D) -1000      (E) None of the above.

4. If  $\lim_{x \rightarrow 3^+} f(x) = 5$  what can be said about  $\lim_{x \rightarrow 3^-} f(x)$ ?

[1]

- (A) It must be 5      (B) It must be  $f(3)$       (C) It must be  $f(5)$   
(D) It must be -5      (E) It cannot be determined

5. If  $-x^2 - x + 1 \leq g(x) \leq x^2 - x + 1$  for all  $x \neq 0$ , what is  $\lim_{x \rightarrow 0} g(x)$ ?

[1]

- (A) 0      (B) 1      (C) 2  
(D)  $g(0)$       (E) Cannot be determined

6. Evaluate the following limit:

[1]

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

(A) 0      (B) 8      (C) -8

(D)  $+\infty$       (E)  $-\infty$

7. If  $\lim_{x \rightarrow 1} f(x) = 3$ ,  $\lim_{x \rightarrow 1} g(x) = -2$ , and  $\lim_{x \rightarrow 1} h(x) = 4$ , evaluate the limit

[1]

$$\lim_{x \rightarrow 1} \left( \frac{2f(x)}{g(x)} + \sqrt{h(x)} \right).$$

(A) -1      (B) 3      (C) 13

(D) 5      (E) 7

8. If the function  $f(x)$  is continuous on the interval  $[-1, 3]$ ,  $f(-1) = 1$ , and  $f(3) = 11$ , which numbers below are guaranteed to be values of  $f(x)$  by the Intermediate Value Theorem on the interval  $(-1, 3)$ ? [1]

I. 3

II.  $\sqrt{2}$

III.  $3\pi$

(A) I only      (B) II only      (C) III only

(D) I and II only      (E) I, II, and III

9. Determine the value of the number  $k$  that makes the function  $f(x)$  below continuous: [1]

$$f(x) = \begin{cases} 1 - kx & \text{if } x < 1, \\ k + x & \text{if } x \geq 1. \end{cases}$$

(A) 0      (B) 1      (C)  $-3/4$

(D)  $1/2$       (E)  $15/17$

10. Consider the function

[1]

$$h(x) = \begin{cases} \frac{1}{x} & \text{if } 0 < x < 1, \\ x & \text{if } x > 1. \end{cases}$$

Which of the following are true?

- I.  $\lim_{x \rightarrow 1^+} h(x)$  exists
  - II.  $\lim_{x \rightarrow 1^-} h(x)$  exists
  - III.  $\lim_{x \rightarrow 1} h(x)$  exists
  - IV.  $h(x)$  is continuous at  $x = 1$
- (A) I only      (B) I and II only      (C) I, II, and III only  
(D) IV only      (E) I, II, III, and IV

11. Evaluate the following limit:

[1]

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 2}}{x}.$$

- (A)  $+\infty$       (B)  $-\infty$       (C) 0  
(D) 1      (E) -1

12. The function  $f(x) = \frac{x^2 + 1}{x^3 + 8}$  has which of the following?

[1]

- (A) no vertical or horizontal asymptotes
- (B) 1 vertical asymptote and 1 horizontal asymptote
- (C) 2 vertical asymptotes and 1 horizontal asymptote
- (D) 1 vertical asymptote and 2 horizontal asymptotes
- (E) 1 vertical asymptote and no horizontal asymptotes

13. For what value of the number  $k$  is the following function differentiable at  $x = 0$ ?

[1]

$$f(x) = \begin{cases} -x & x \leq 0 \\ k & x > 0 \end{cases}$$

- (A)  $-2$     (B)  $-1$     (C)  $0$
- (D)  $1$     (E) No value of  $k$  makes this function differentiable at  $x = 0$

14. If  $f(x) = 3x^{10}$ , then  $\lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h}$  is which of the following?

[1]

(A)  $f'(x)$       (B)  $f'(1)$       (C) Does not exist

(D) 0      (E) None of the above

15. If we want to calculate the derivative  $f'(x)$  of  $f(x) = 3x + 4$  using the limit definition of the derivative which of the following limits do we need to evaluate and to what does the limit evaluate?

[1]

(A)  $\lim_{h \rightarrow 0} \frac{3(x+h) + 4 - (3x+4)}{h} = 3$

(B)  $\lim_{h \rightarrow 0} \frac{3(x+h) + 4 - (3x+4)}{h} = 0$

(C)  $\lim_{h \rightarrow 0} \frac{3h + 4 - (3x+4)}{h} = 3x + 3$

(D)  $\lim_{h \rightarrow 0} \frac{3(x+h) + 4 - (3h+4)}{h} = 3$

(E) None of the above.



16. Below is the graph of the derivative  $g'(x)$  of a function  $g(x)$ .

[1]

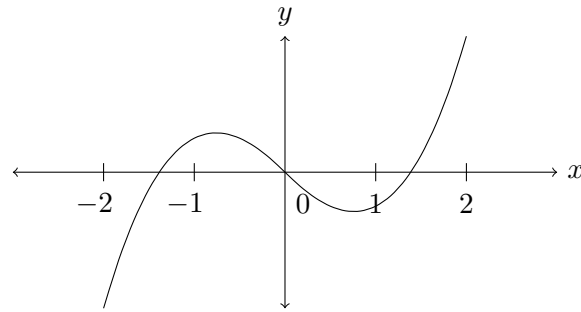
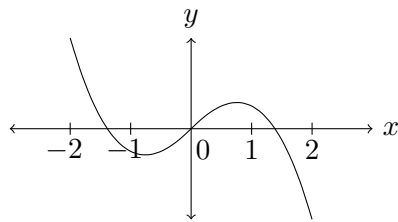


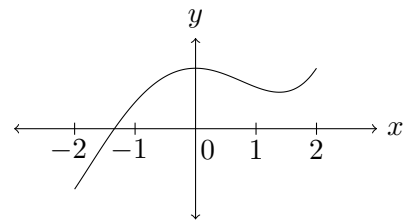
Figure 1: Graph of  $g'(x)$ .

Which of the following is a possible graph of  $g(x)$ ?

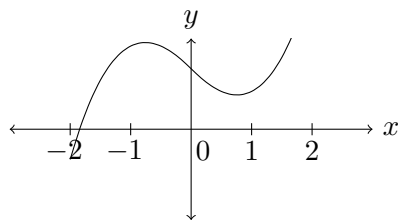
(A)



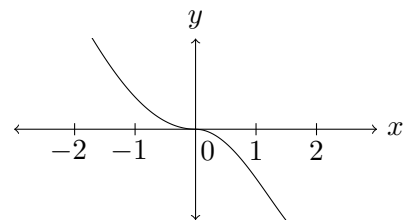
(B)



(C)



(D)



(E) None of the above. It looks like:

17. If  $f(x) = \sqrt{x} + \frac{1}{\sqrt{x}}$  for  $x > 0$ , then  $f'(4)$  is which of the following?

[1]

(A)  $\frac{5}{4}$       (B)  $\frac{3}{4}$       (C)  $\frac{3}{16}$

(D)  $\frac{255}{32}$       (E)  $\frac{257}{32}$