



University of Connecticut
Department of Mathematics

MATH 1131

PRACTICE PROBLEMS FOR EXAM 1

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

Read This First!

- These practice problems are NOT sufficient review for the exam and do not represent the exact length of the exam. You should also use other resources, such as the textbook, worksheets, and Paul's Online notes to find further practice problems on topics that you have struggled with (or that you have trouble with on the practice problem set).
- Use these practice problems, in addition to other course materials, as a guide to determine what you need to study more deeply.
- The exam will be 50 minutes during your regular discussion section meeting.
- Please read each question carefully. All questions are multiple choice. There is only one correct choice for each answer.
- On the exam, please carefully check all of your final answers. The submitted letter answers are the **ONLY** place that counts as your official answers.
- You may **NOT** use a calculator or any other references on the exam, and **you are expected to work independently.**

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) ∞ (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. 3π

(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]

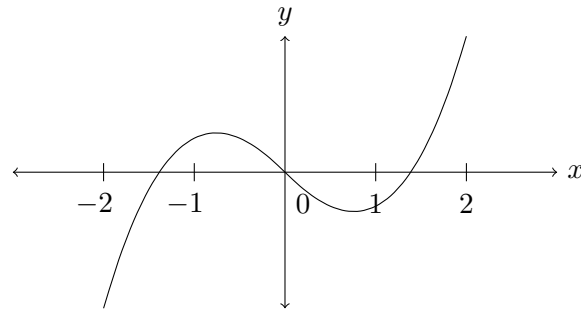
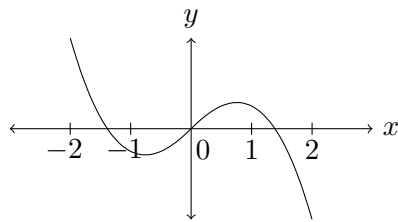


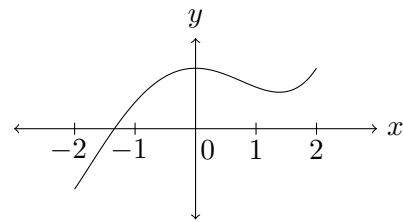
Figure 1: Graph of $g'(x)$.

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

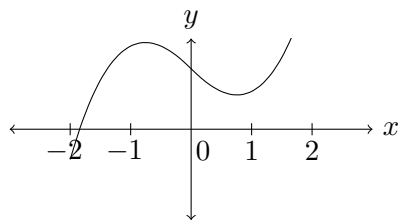
(A)



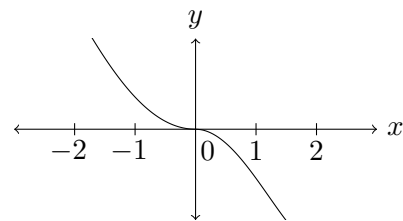
(B)



(C)



(D)



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