



*University of Connecticut
Department of Mathematics*

MATH 1131

PRACTICE EXAM 1

SPRING 2019

NAME: _____

SIGNATURE: _____

Instructor Name: _____ Lecture Section: _____

TA Name: _____ Discussion Section: _____

Read This First!

- Please read each question carefully. All questions are multiple choice. There is only one correct choice for each answer. Each question is one point.
- Indicate your answers on the answer sheet. The answer sheet is the **ONLY** place that counts as your official answers.
 - (1) When you're done, hand in **both** the exam booklet and the answer sheet.
 - (2) You will receive the exam booklet back after the exam is graded. The booklet is not graded, but you may circle answers there for your records.
- Calculators are allowed **below the level of TI-89**. In particular, the **TI-Nspire is not allowed**. No books or other references 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) ∞ (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. When showing $\lim_{x \rightarrow 2} (5x + 1) = 11$ by the $\varepsilon - \delta$ definition of limits, which of the following is an *acceptable* value for δ when $\varepsilon = 0.01$? [1]

(A) 0.05 (B) 0.5 (C) 0.1
(D) 0.02 (E) 0.001

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. 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

12. Evaluate the following limit:

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

(A) $+\infty$ (B) $-\infty$ (C) 0

(D) 1 (E) -1

[1]

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

(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

[1]

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]

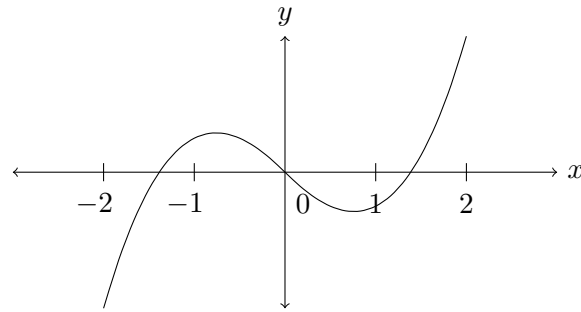
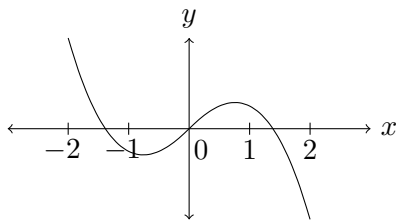


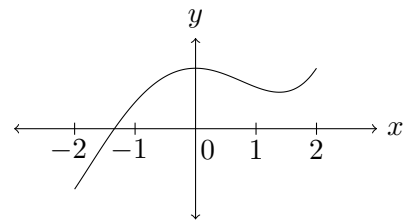
Figure 1: Graph of $g'(x)$.

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

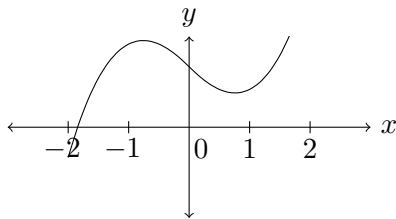
(A)



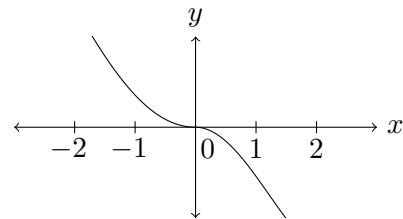
(B)



(C)



(D)



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

17. 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 $x = 0$

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

[1]

- (A) $\frac{5}{4}$ (D) $\frac{3}{4}$ (C) $\frac{3}{16}$
(B) $\frac{255}{32}$ (E) $\frac{257}{32}$