University of Connecticut
Department of Mathematics

MATH 1131   PRACTICE PROBLEMS FOR EXAM 1   FALL 2019

NAME: _____

SIGNATURE: _____

Instructor Name: _____   Lecture Section: _____

TA Name: _____   Discussion Section: _____

Read This First!

- This problem set is not meant to provide complete coverage for the exam. It is designed for you to use as a diagnostic tool. If you struggle with a problem here, that gives you a topic to review and work several related problems. You should also be using homework, worksheets, and quizzes as a guide to determine what topics to review for the exam.

- The exam format and instructions will be similar to those in this document.

- 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.

- **No calculators are 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   [1]
   average velocity over the interval $1 \le t \le 4$?

   (A) 8   (B) 0   (C) 2

   (D) 5   (E) -1

2. Evaluate the following limit: [1]
$$\lim_{x \to 1^-} \frac{x-3}{x-1}.$$

   (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]

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

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 $\lim_{x \to 3^+} f(x) = 5$ what can be said about $\lim_{x \to 3^-} f(x)$?   [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 $-x^2 - x + 1 \le g(x) \le x^2 - x + 1$ for all $x \ne 0$, what is $\lim_{x \to 0} g(x)$?   [1]

(A) 0   (B) 1   (C) 2

(D) $g(0)$ (E) Cannot be determined

6. Evaluate the following limit: [1]
$$\lim_{x \to 4} \frac{x^2 - 8x + 16}{x - 4}.$$

   (A) 0   (B) 8   (C) -8

   (D) $+\infty$ (E) $-\infty$

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

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

   (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   [1]
   numbers below are guaranteed to be values of $f(x)$ by the Intermediate Value Theorem on the
   interval $(-1, 3)$?

$$\text{I. } 3$$

$$\text{II. } \sqrt{2}$$

$$\text{III. } 3\pi$$

   (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]

$$h(x) = \begin{cases} \dfrac{1}{x} & \text{if } 0 < x < 1, \\[2ex] x & \text{if } x > 1. \end{cases}$$

Which of the following are true?

I. $\displaystyle\lim_{x \to 1^+} h(x)$ exists

II. $\displaystyle\lim_{x \to 1^-} h(x)$ exists

III. $\displaystyle\lim_{x \to 1} h(x)$ 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]

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

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

(D) 1   (E) -1

12. The function $f(x) = \dfrac{x^2 + 1}{x^3 + 8}$ 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 $\displaystyle\lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$ 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) $\displaystyle\lim_{h \to 0} \frac{3(x+h) + 4 - (3x+4)}{h} = 3$

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

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

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

    (E) None of the above.

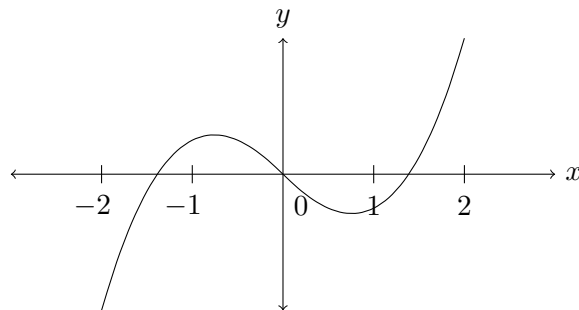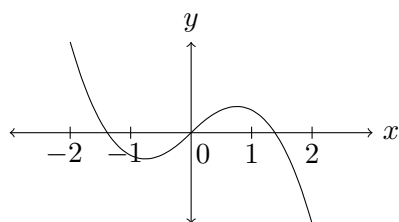16. Below is the graph of the derivative $g'(x)$ of a function $g(x)$. [1]
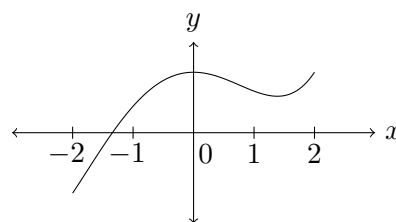

Figure 1: Graph of $g'(x)$.

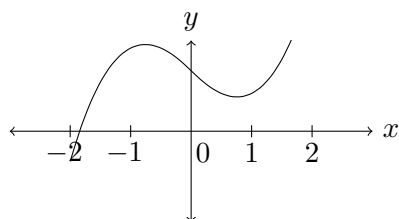Which of the following is a possible graph of $g(x)$?
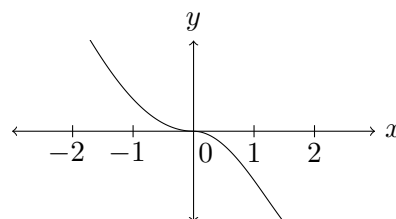
(A)

(B)

(C)

(D)

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

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

(A) $\dfrac{5}{4}$ (D) $\dfrac{3}{4}$ (C) $\dfrac{3}{16}$

(B) $\dfrac{255}{32}$ (E) $\dfrac{257}{32}$