Math 1151 Midterm 1 Name: _____

September 11, 2018 OSU name.#: _____

Form A Lecturer: _____

Page 1 of 8 Recitation Instructor: _____

Recitation Time: _____

Instructions

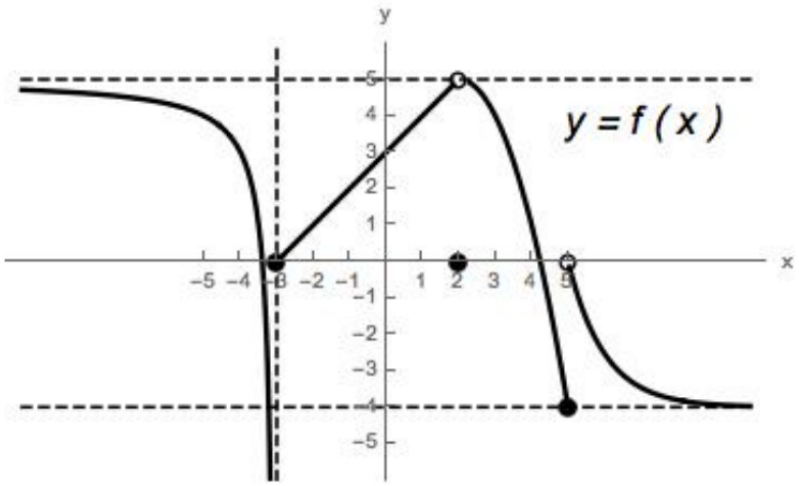
- **Show all relevant work** to receive full credit on Problems 2(a),(b), 3, 4 and 5.
  Incorrect answers with substantially correct work may receive partial credit.
  Unsupported answers may receive no credit.

  You do not need to show work for Problems 1, and 2(c).
- Give **exact** answers unless instructed to do otherwise.
- **No calculators, phones, or other devices may be used** during the exam.

  Do not have these devices out!
- No notes or references are permitted.
- The allotted time for this exam is **55 minutes**.
- The exam consists of 5 problems starting on Page 2 and ending on Page 8. Check that your exam is complete before you begin.

Problem 1 [15 points]	
Problem 2 [12 points]	
Problem 3 [8 points]	
Problem 4 [22 points]	
Problem 5 [18 points]	
Total [75 points]	

1. (15 pts) The graph of a function f, defined on $(-\infty, +\infty)$, is given in the figure below.
Use the graph of f to complete the problems (a) - (g).



(a) Determine the **range** of f. Use interval notation to write your answer.

(b) Determine the value or write "does not exist".

i. $f(5) =$ ii. $f(-3) =$

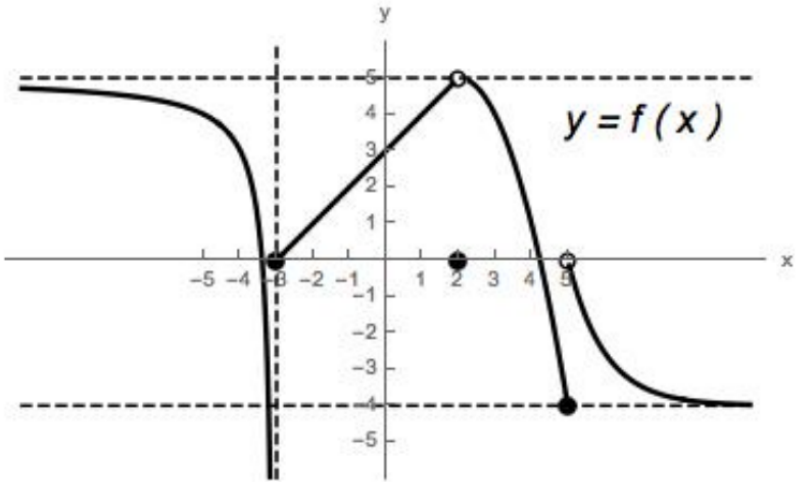
(c) Write an expression for $f(x)$, if $-3 \leq x < 2$.

$f(x) =$, if $-3 \leq x < 2$.

(d) Determine the limit or write "does not exist". Write "does not exist" only if a limit does not exist and is not $+\infty$ or $-\infty$.

i. $\lim_{x \to 2} f(x) =$ iii. $\lim_{x \to +\infty} f(x) =$ v. $\lim_{x \to -3^+} f(x) =$

ii. $\lim_{x \to -\infty} f(x) =$ iv. $\lim_{x \to -3^-} f(x) =$ vi. $\lim_{x \to 5} f(x) =$



(e) Determine the (largest) **intervals of continuity** of f. Use interval notation to write your answer.

(f) MULTIPLE CHOICE! CIRCLE THE CORRECT ANSWER!

Find a number a for which the following statement is true:

The function f is defined at a, $\lim_{x \to a} f(x)$ exists, but f is **not continuous** at a.

i. $a = 0$
ii. $a = -4$
iii. $a = 2$
iv. $a = 5$
v. $a = -3$
vi. Such a number does not exist.

(g) MULTIPLE CHOICE! CIRCLE THE CORRECT ANSWER!

Find a number a for which the following statement is true:

The function f is defined at a, $\lim_{x \to a^-} f(x) = f(a)$, but f is **not continuous** at a.

i. $a = 0$
ii. $a = -4$
iii. $a = 2$
iv. $a = 5$
v. $a = -3$
vi. Such a number does not exist.

2. (12 pts) Functions f and g are **continuous** on the interval $(-4, 4)$.
Some values of the functions f and g are given in the table below.

x	-2	-1	0	1	2	3
f(x)	-4	2	5	4	3	1
g(x)	0	-1	-2	3	1	2

(a) Use the table above to find the following values or say "we don't have enough information".
Show your work!

i. $f(g(2)) =$

ii. $\lim_{x \to 0}(f(x)g(x) - f(g(x))) =$

(b) Use the table above to find the limit. First, write the form of the limit.
Write "does not exist" only if the limit does not exist and is not $+\infty$ or $-\infty$.
Show your work and justify your answer.

$\lim_{h \to 0^+} \dfrac{g(3+h) - 4}{h} =$ FORM:

(c) Circle the correct answer!
The Intermediate Value Theorm implies that the equation $f(x) = 0$ has a solution on the interval

i. $(-4, -3)$

ii. $(-3, -2)$

iii. $(-2, -1)$

iv. $(-1, 0)$

v. $(0, 1)$

vi. $(1, 2)$

vii. $(2, 3)$

viii. The Intermediate Value Theorem does not apply.

3. (8 pts) Explain how the **Intermediate Value Theorem**, (IVT), can be used to show that the equation

$$x \sin\left(\frac{\pi}{6}x\right) = 1$$

has a solution on the interval $(0, 2)$.
Make sure that the conditions of the IVT are satisfied before you apply the theorem.

4. (22 pts) Let g be the function given by

$$g(x) = \begin{cases} e^x & \text{if } x \leq 0. \\ \dfrac{1+\sqrt{x}}{1-\sqrt{x}} & \text{if } x > 0 \text{ and } x \neq 1, \end{cases}$$

(a) (10 pts) Write the form of the limit (where indicated) and evaluate the limit. Write "does not exist" only if the limit does not exist and is not $+\infty$ or $-\infty$. Show your work and justify your answer.

i. $\lim_{x \to 1^-} g(x) =$ FORM:

ii. $\lim_{x \to -\infty} g(x) =$

iii. $\lim_{x \to +\infty} g(x) =$ FORM:

(b) (2 pts) Write the **equation** of each **vertical asymptote** of g. Write "none" if appropriate. Justify your answer.

(c) (2 pts) Write the **equation** of each **horizontal asymptote** of g. Write "none" if appropriate. Justify your answer.

(d) (6 pts) Use the **definition of continuity** to determine whether the function g is continuous at 0. Show your work. Justify your answer!

(e) (2 pts) Determine the **intervals of continuity** of g. Use interval notation to write your answer.

5. (18 pts) Write the form of the limit and evaluate each limit. Write "does not exist" only if the limit does not exist and is not $+\infty$ or $-\infty$. Do not use L'Hôpital's Rule. Show your work.

(a) $\lim_{x\to 3^-} \dfrac{(x-5)^2-4}{|x-3|} =$ FORM:

(b) $\lim_{x\to 1} \dfrac{\dfrac{x}{x+5}-\dfrac{1}{6}}{x-1} =$ FORM:

(c) $\lim_{x\to -\infty} \dfrac{\sqrt{3x^2-3}+2}{x-2} =$ FORM: