

**Math 1151 Midterm 1**

Name: \_\_\_\_\_

January 31 2017

OSU name.#: \_\_\_\_\_

Form A

Lecturer: \_\_\_\_\_

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Recitation Instructor: \_\_\_\_\_

Recitation Time: \_\_\_\_\_

**Instructions.**

- **Show all relevant work** to receive full credit on Problems 1(g), 2, 3, 5 and 6. Incorrect answers with substantially correct work may receive partial credit.

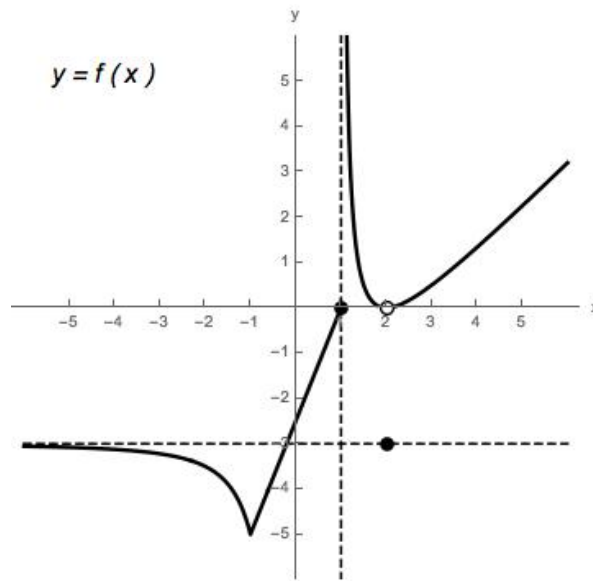
**Unsupported answers may receive no credit.**

You do not need to show work for Problems 1(a),1(b),1(c),1(d),1(e) and 1(f) and 4.

- 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 6 problems starting on Page 2 and ending on Page 8. Check that your exam is complete before you begin.

<b>Problem 1</b> [26 points]	
<b>Problem 2</b> [12 points]	
<b>Problem 3</b> [16 points]	
<b>Problem 4</b> [14 points]	
<b>Problem 5</b> [22 points]	
<b>Problem 6</b> [10 points]	
<b>Total</b> [100 points]	

1. (26 pts) The graph of a function  $f$  is given in the figure below.



Use the graph of  $f$  to complete the problems below. Note:  $f(-1) = -5$

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

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

i.  $f(2) =$

ii.  $f'(0) =$

(c) 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.  $\lim_{x \rightarrow 2} f(x) =$

iii.  $\lim_{x \rightarrow 1} f(x) =$

ii.  $\lim_{x \rightarrow 1^+} f(x) =$

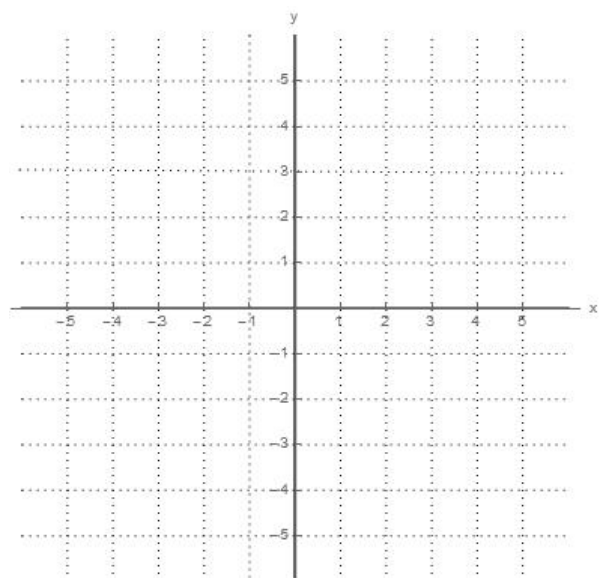
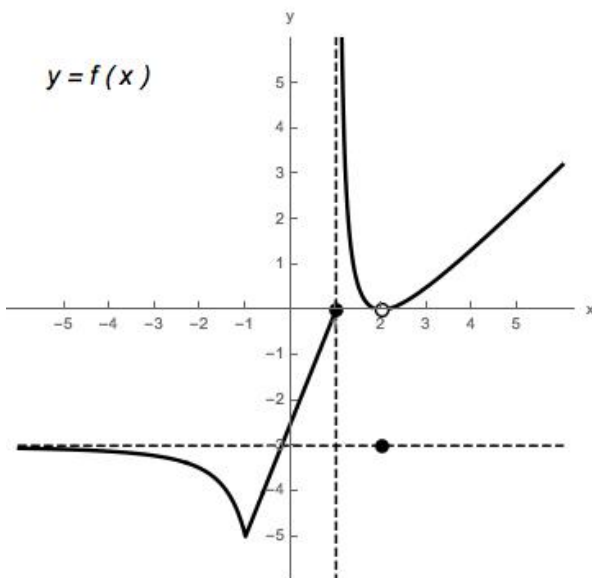
iv.  $\lim_{x \rightarrow -\infty} f(x) =$

(d) Write the **equation(s)** of any **vertical asymptote(s)**. Write “none” if appropriate.

(e) Write the **equation(s)** of any **horizontal asymptote(s)**. Write “none” if appropriate.

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

(g) On the grid below, sketch the graph of  $y = \frac{f(x-2)}{3}$ .



2. (12 pts) Let  $f(x) = \frac{1}{x-4}$ . Use the **definition of derivative** to compute  $f'(6)$ . Show your work.

3. (16 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)  $\lim_{x \rightarrow 6^-} \frac{|x-6|}{x^2 - 5x - 6} =$

(b)  $\lim_{x \rightarrow 3} \frac{\sqrt{2x+10} - 4}{x-3} =$

4. (14 pts) A function  $g$  is **continuous** and **differentiable** on the interval  $(0, 4)$ . Some values of the function  $g$  and its derivative,  $g'$ , are given in the table below.

$x$	1	2	3
$g(x)$	8	7	2
$g'(x)$	-5	4	-4

(a) Use the table above to find the following values:

i.  $(g(3))^2 =$

ii.  $g(g(3)) =$

iii.  $\lim_{x \rightarrow 3} \ln(g(x) - 1)$

iv.  $\lim_{x \rightarrow 3} \frac{g(x) - 2}{x - 3} =$

- (b) Use the table above to write an equation of the tangent line to the curve  $y = g(x)$  at the point where  $x = 3$ .

5. (22 pts) Let  $g$  be the function given by

$$g(x) = \begin{cases} \frac{-4}{e^x + 1} & \text{if } x \leq 0. \\ \frac{3x + 4}{x - 2} & \text{if } x > 0 \text{ and } x \neq 2, \end{cases}$$

(a) (5 pts) Use the **definition of continuity** to determine whether the function  $g$  is continuous at 0. Show your work.

(b) (5 pts) Write the **equation(s)** of any **vertical asymptote(s)** for the graph of  $g$ . Write “none” if appropriate. Justify your answer by evaluating relevant limit(s).

(c) (4 pts) Determine the **intervals of continuity** of  $g$ . Use interval notation to write your answer.

Use the expression for  $g$  on the previous page to complete the following problems.

(d) (6 pts) Evaluate each limit. Write “does not exist” only if the limit does not exist and is not  $+\infty$  or  $-\infty$ . Show your work.

i.  $\lim_{x \rightarrow -\infty} g(x) =$

ii.  $\lim_{x \rightarrow +\infty} g(x) =$

(e) (2 pts) Write the **equation(s)** of any **horizontal asymptote(s)** for the graph of  $g$ . Write “none” if appropriate.

6. (10 pts) Explain how the **Intermediate Value Theorem** can be used to show that the equation

$$\sin x + 3x = 7$$

has a solution on the interval  $(0, \pi)$ .