

Math 1151 Midterm 2

Name: _____

October 17, 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 2, 3(c), 4, 5 and 6 .
Incorrect answers with substantially correct work may receive partial credit.

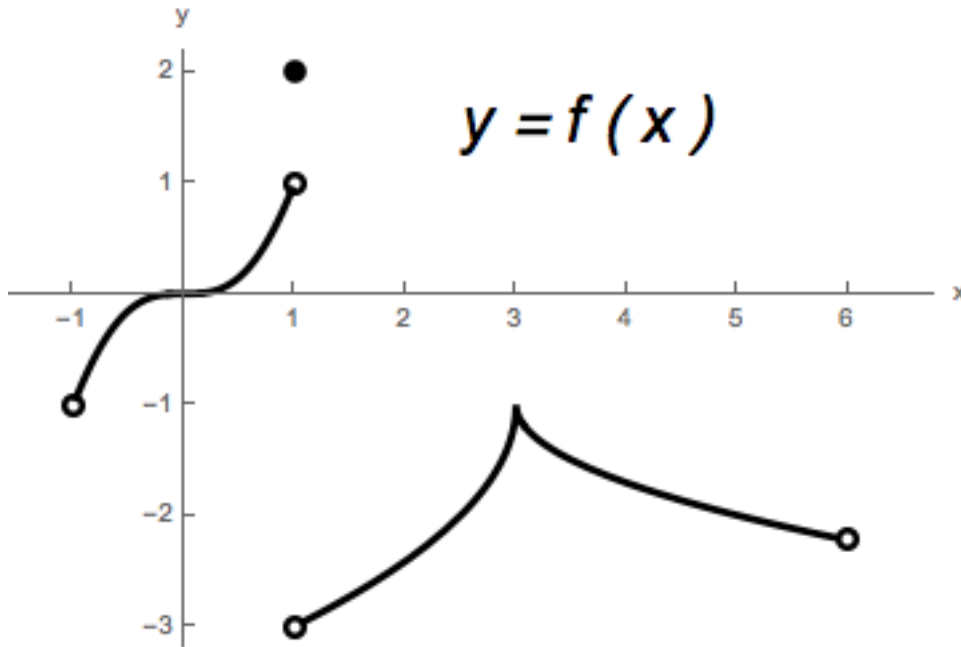
Unsupported answers may receive no credit.

You do not need to show work for Problems 1, 3(a), and 3(b).

- 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 7. Check that your exam is complete before you begin. Page 8 is blank.

Problem 1 [18 points]	
Problem 2 [16 points]	
Problem 3 [14 points]	
Problem 4 [16 points]	
Problem 5 [18 points]	
Problem 6 [18 points]	
Total [100 points]	

1. (18 pts) Let f be the function with domain $(-1, 6)$ given by the graph below.



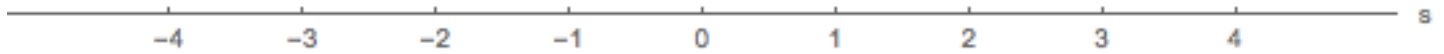
Use the graph of f to answer the following questions.

- (a) Order the following four numbers from smallest to largest: $f'(-0.3)$, $f'(0)$, $f'(2.9)$, $f'(4)$.
- (b) List the **critical point(s)** of f on the interval $(-1, 6)$. Write "none" if appropriate.
- (c) List the **x-coordinates(s)** at which f has a **local maximum**. Write "none" if appropriate.
- (d) List the **x-coordinates(s)** at which f has a **local minimum**. Write "none" if appropriate.
- (e) List the **x-coordinates(s)** at which f has a **absolute maximum**. Write "none" if appropriate.
- (f) List the **x-coordinates(s)** at which f has a **absolute minimum**. Write "none" if appropriate.

2. (16 pts) A function s is defined by the equation

$$s(t) = t - t^2, \quad 0 \leq t \leq 5.$$

$s(t)$ gives the position of an object moving along a horizontal line (see the figure below) at the time t , where s is measured in feet and t in seconds.



(a) Find $s(2)$, and mark the position of the object at the time $t = 2$ on the line above.

(b) Find the **average velocity**, $v_{AV}(t)$, of the object over the interval $[1, t]$.

(c) Using the expression found in part (b), evaluate the limit

$$\lim_{t \rightarrow 1} v_{AV}(t)$$

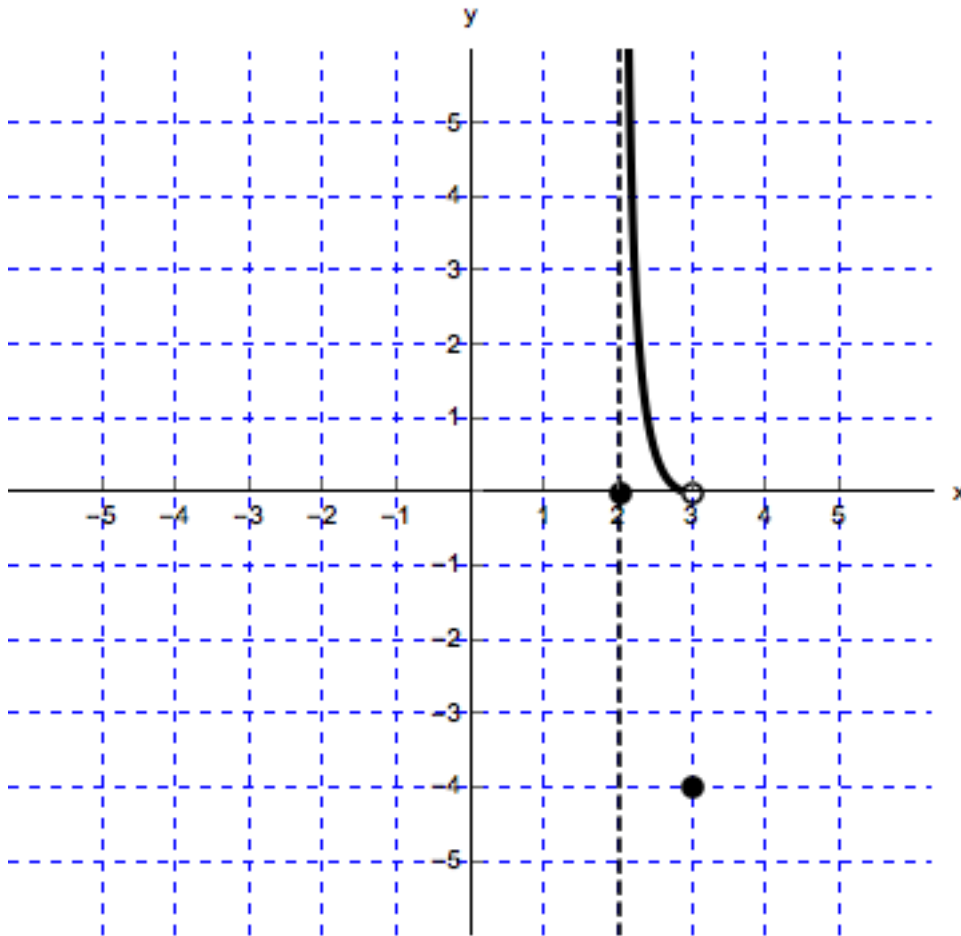
(d) What does the limit in part (c) represent?

(e) Find the velocity, $v(t)$ and acceleration, $a(t)$, $0 < t < 5$.

(f) Determine when is the object moving to the right.

Write your answer in interval notation. Show your work.

3. (14 pts) The graph of a function f is given in the figure below.



(a) Use the graph of f to answer the following questions.

i. Find the domain of f . Write your answer in interval notation.

ii. Find the domain of f^{-1} . Write your answer in interval notation.

(b) Find the value or write "not defined".

i. $f^{-1}(-2)$

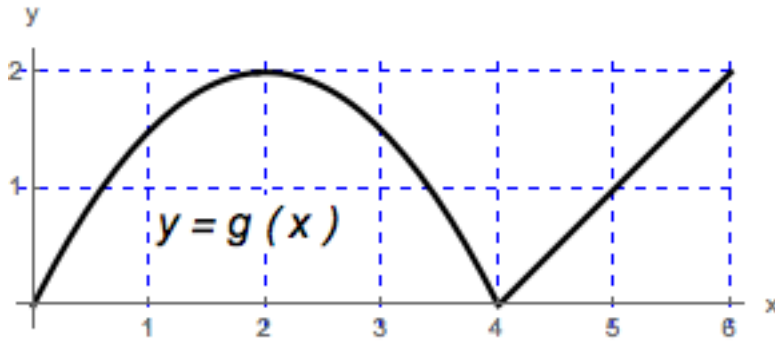
ii. $f(f^{-1}(4))$

(c) Sketch the graph of f^{-1} in the figure above.

4. (16 pts) Let f be a differentiable one-to-one function with domain $(0, 6)$ with the particular values of f and f' given in the table below, and let f^{-1} be the inverse function of f .

Let g be the function given by the graph below.

x	$f(x)$	$f'(x)$
1	2	4
2	3	5
3	4	2
4	6	3



Find the value or write "not defined". Show your work!

(a) $\lim_{x \rightarrow 5} \frac{g(x) - g(5)}{x - 5}$

(b) $\frac{d}{dx} [g'(x + 2)f(x)]$ at $x = 3$

(c) $\frac{d}{dx} [f^{-1}(x)]$ at $x = 2$

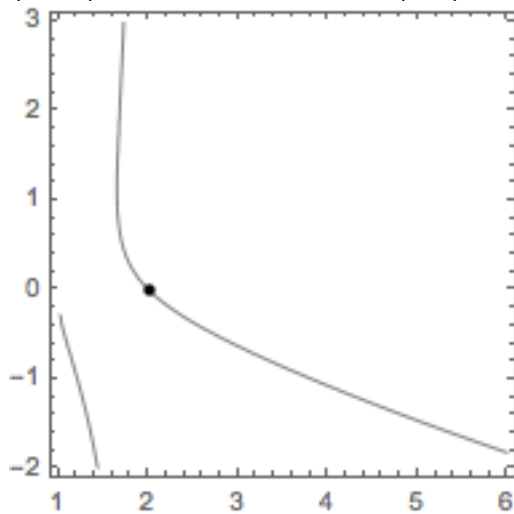
(d) $\frac{d}{dx} [x^{g(x)}]$ at $x = 2$

5. (18 pts) A curve is given by the equation $\tan^{-1}(y) + x + y \ln(x - 1) = 2$.

The questions (a) - (e) below are about this curve.

(a) (10 pts) Find $\frac{dy}{dx}$, using **implicit differentiation**. Show your work. .

(b) (2 pts) Verify that the point $(2, 0)$ lies on this curve.

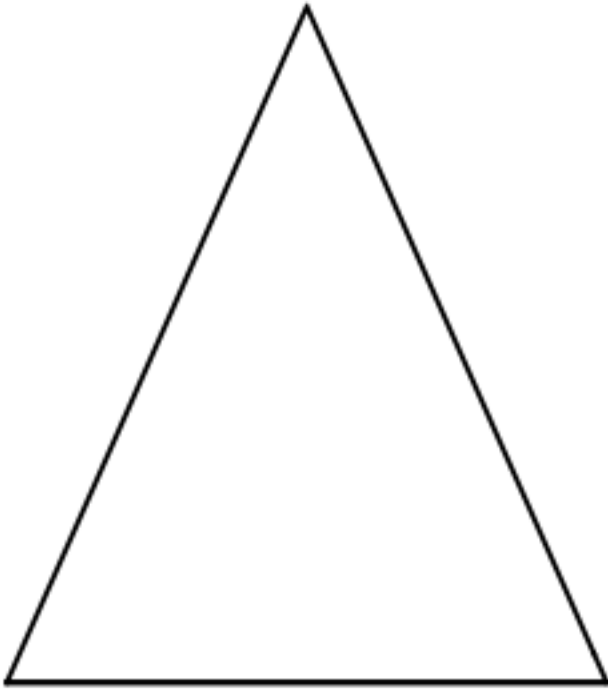


(c) (2 pts) A part of the curve that contains a point $(2, 0)$ is shown in the figure. In the figure above, draw the line tangent to the curve at the point $(2, 0)$.

(d) (2 pts) Find the slope of the line tangent to the curve at the point $(2, 0)$.

(e) (2pts) Write an equation of the line tangent to the curve at the point $(2, 0)$.

6. (18 pts) An isosceles triangle has two sides of length s (measured in feet) and the base of length 6 ft. Let A be the area of the triangle.



- (a) Label the figure above.
(b) Suppose that s is increasing at a rate of 4 ft/min.

At what rate is the area, A , of the triangle changing when $A = 12 \text{ ft}^2$?

B L A N K P A G E