

Write your name clearly and indicate your recitation section with an X. No calculator is permitted. Use only the scrap paper given in the exam. Do not tear any pages from the exam.

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

X	Instructor	Time
	Harrison Hsu	11:00am-12:15am
	Harrison Hsu	12:30pm-1:45pm
	Gyuhak Kim	11:00am-12:15am
	Gyuhak Kim	12:30pm-1:45pm

*I pledge that I have observed the NYU honor code, and that I neither given nor received unauthorized assistance during this exam.*

Signature: \_\_\_\_\_

Do not write in the chart below

Problem	Score
MC	
1	
2	
3	
Total	

This is the multiple choice section of the exam. Each equation is worth 3 points. There is no partial credit for any multiple choice problem. **Enter your final selections in the table given.**

Problem	
1	
2	
3	
4	
5	
6	
7	
8	

1. Explain how the graph of  $g$  is obtained from the graph of  $f$  where  $f(x) = |x|$  and  $g(x) = |x + 10| - 10$

- (a) Shift right 10 units, then shift up 10 units.
- (b) Shift left 10 units, then shift down 10 units.
- (c) Shift right 10 units, then shift down 10 units.
- (d) shift left 10 units, then up 10 units.
- (e) none of the above.

2. Consider the functions

$$f(x) = x^2 - 2 \quad \text{and} \quad g(x) = \frac{1}{\sqrt{x}}.$$

The function  $h = f \circ g$  and its domain are

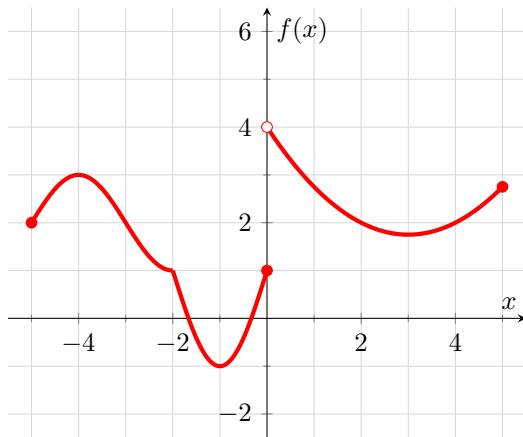
- (a)  $h(x) = \frac{1-2x}{x}$ , with domain  $(-\infty, 0) \cup (0, \infty)$ .
- (b)  $h(x) = \frac{1-2x}{x}$ , with domain  $(0, \infty)$ .
- (c)  $h(x) = \left(\frac{1}{\sqrt{x}} - 2\right)^2$ , with domain  $(-\infty, 0) \cup (0, \infty)$ .
- (d)  $h(x) = \left(\frac{1}{\sqrt{x}} - 2\right)^2$ , with domain  $(0, \infty)$ .
- (e) None of these.

3. Write the quadratic function  $f(x) = x^2 + 4x - 1$  in standard form.

- (a)  $f(x) = (x + 1)^2 + 5$ .
- (b)  $f(x) = (x + 2)^2 - 5$ .
- (c)  $f(x) = (x - 1)^2 + 4$ .
- (d)  $f(x) = (x + 2)^2 - 4$ .
- (e) None of the above.

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4. The graph of the function  $f(x)$  is shown in the following plot.



Which of the following is **NOT** true?

- (a) The domain of  $f$  is  $[-5, 5]$ .
- (b) The range of  $f$  is  $[-1, 4)$ .
- (c) The function is increasing on  $[-1, 0] \cup [3, 5]$ .
- (d) The function has a local minimum at  $(-1, -1)$ .
- (e) None of the above are false.

5. John's Pizza charges a base price of \$15 for a large cheese pizza plus \$2.00 for each additional topping. Let  $p$  be the price of a pizza with  $n$  number of toppings. Find a formula for the number of toppings  $n$  in terms of the price  $p$ .

- (a)  $n = 2p + 15$ .
- (b)  $n = p - 15$ .
- (c)  $n = 15 - 2p$ .
- (d)  $n = \frac{1}{2}(p - 15)$ .
- (e) None of the above.

6. The end behavior of the polynomial  $P(x) = (1 - x)(2 - x)(3 - x)$  is

- (a)  $P(x) \rightarrow \infty$  as  $x \rightarrow \infty$ , and  $P(x) \rightarrow \infty$  as  $x \rightarrow -\infty$ .
- (b)  $P(x) \rightarrow \infty$  as  $x \rightarrow \infty$ , and  $P(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$ .
- (c)  $P(x) \rightarrow -\infty$  as  $x \rightarrow \infty$ , and  $P(x) \rightarrow \infty$  as  $x \rightarrow -\infty$ .
- (d)  $P(x) \rightarrow -\infty$  as  $x \rightarrow \infty$ , and  $P(x) \rightarrow -\infty$  as  $x \rightarrow -\infty$ .
- (e) None of these.

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7. The function  $k(x) = \frac{1-x}{x}$  is given. Which of the following is its inverse  $k^{-1}$ ?

(a)  $k^{-1}(x) = \frac{1}{1+x}.$

(b)  $k^{-1}(x) = \frac{1}{1-x}.$

(c)  $k^{-1}(x) = \frac{x}{1+x}.$

(d)  $k^{-1}(x) = \frac{x}{1-x}.$

(e) None of these.

8. Find all horizontal and vertical asymptotes (if any) of the function

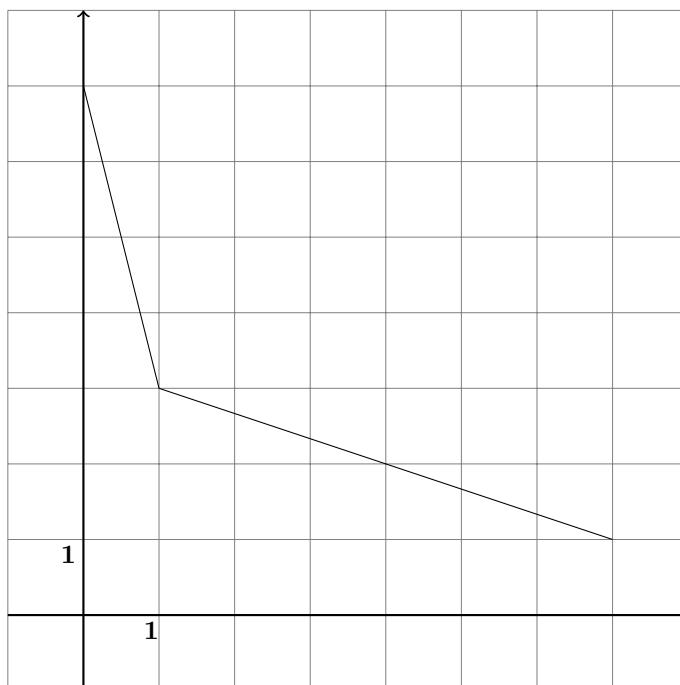
$$f(x) = \frac{4x-5}{x^2-9}.$$

- (a) Vertical asymptote  $x = \pm 3$ . Horizontal asymptote  $y = 0$ .
- (b) Vertical asymptote  $x = \pm 3$ . No horizontal asymptote.
- (c) Vertical asymptote  $x = 3$ . Horizontal asymptote  $y = \frac{5}{4}$ .
- (d) Vertical asymptote  $x = 3$ . No horizontal asymptote.
- (e) None of the above.

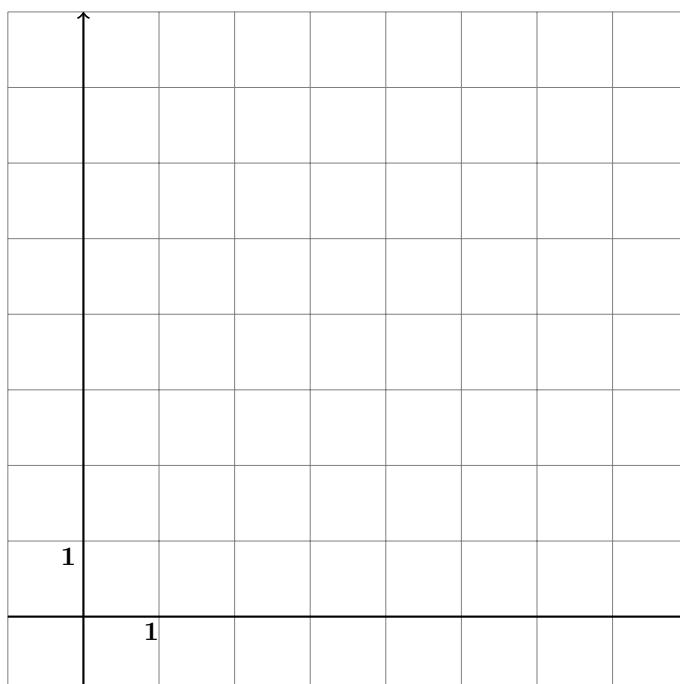
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This is the open response section of the midterm. Partial credit may be given. Answers without justification will receive no credit.

- 1.(10 points) Below is the graph of  $f(x)$ . You may assume that the function  $f(x)$  terminates at the points  $(0, 7)$  and  $(7, 1)$ .



Graph  $f^{-1}(x)$  below. Show all work. If you need more space use the back of this page, but make sure that the final graph is sketched below.



**Scratch Paper**

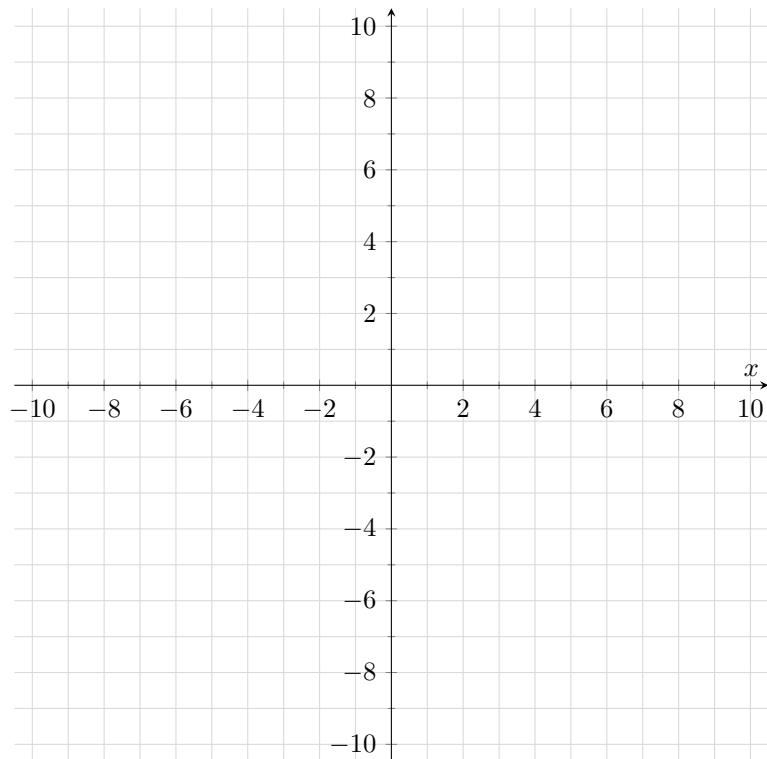
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2. (15 points) Parts (a)–(c) below are about the function

$$h(x) = \sqrt{x + 1}.$$

Answer parts (a)–(c) and show all your work in the space below. For parts (b) and (c) use the axes provided below. If you need more space use the back of this page, but make sure that the final graphs are sketched below.

(a) (4 points) Sketch the graph of  $h$ . Include 3 clearly labeled points on the graph.



(b) (5 points) Use part (a) to sketch, on the same axes, the graph of  $h^{-1}$ . Include 3 clearly labeled points on the graph. Make sure to label clearly which of the graphs is  $h$  and which is  $h^{-1}$ .

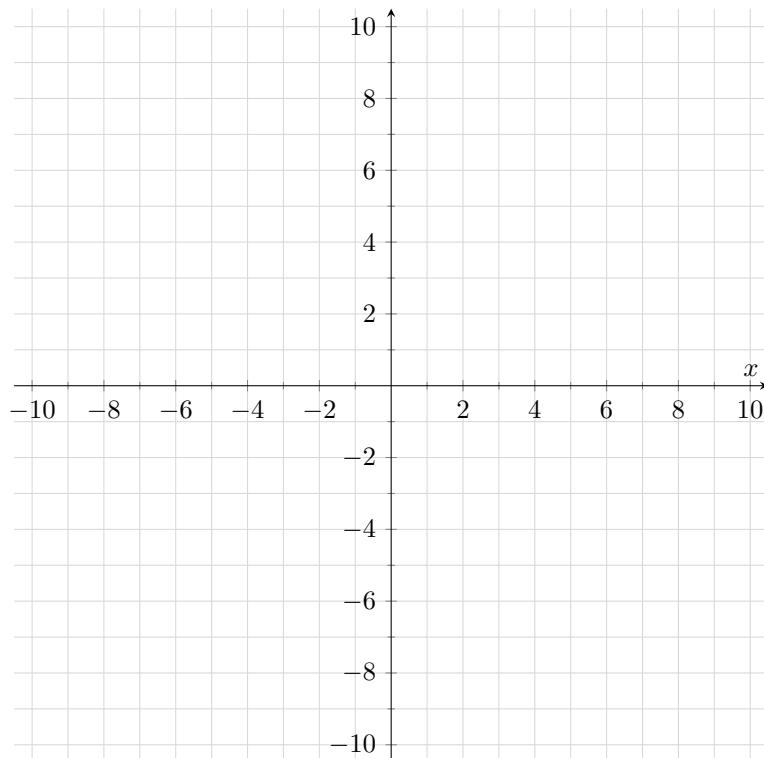
(c) (6 points) Find an equation for  $h^{-1}(x)$ .

**Scratch Paper**

3. (15 points) Let

$$f(x) = x^2 - 2x + 2 \quad \text{and} \quad g(x) = -(x + 2)^2 + 1.$$

Graph  $f$  and  $g$  on the same  $xy$ -plane given below. Make sure to label the vertex and  $x$  and  $y$  intercept(s) (if any) of the functions  $f$  and  $g$ . Show all work. If you need more space use the back of this page, but make sure that the final graphs are sketched below.



**scratch Paper**

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