

**RULES:**

- No books or notes or calculators allowed.
- No bathroom breaks until after you have completed and turned in your test.
- Out of consideration for your classmates, do not make disturbing noises during the exam. If you need a tissue, please ask for one.
- **Phones and other electronic devices must be off during the exam.**

*Cheating will not be tolerated.* If there is any indication that a student may have given or received unauthorized aid on this test, the case will be handed over to the ISU Office of Judicial Affairs. When you finish the exam, please sign the statement on the last page acknowledging that you understand this policy.

-scratch work-

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

**Part 1.** Complete the table by blacking out letters corresponding to correct answers.

1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)

In Problems 1–4 assume  $f(x) = (x - 1)^3$ . (If the expression you are asked to compute is not defined or does not appear in the list of possible answers, choose “none of these.”)

1. Find the value of  $f(x)$  when  $x = -1$ .

- (a)  $-8$                       (b)  $-4$                       (c)  $0$                       (d)  $8$                       (e) none of these

2. What values of  $x$  give a  $f(x)$  value of  $-1$ .

- (a)  $-1$                       (b)  $0$                       (c)  $1$                       (d)  $2$                       (e) none of these

3. If  $g(x) = \frac{1}{\sqrt{9-2x}}$ , what is the value of  $g(f(-1))$ ?

- (a)  $-1/\sqrt{7}$                       (b)  $1/\sqrt{17}$                       (c)  $1/5$                       (d)  $1/3$                       (e) none of these

4. Simplify the expression  $\sqrt[3]{8r^6}\sqrt{s^4t^6}$ . (Assume that  $r$ ,  $s$ , and  $t$  are positive.)

- (a)  $2r^2s^6t^4$                       (b)  $8r^2s^2t^3$                       (c)  $2r^2s^6t^3$                       (d)  $2r^2s^2t^3$                       (e) none of these

5. Find the *domain* of the function

$$g(x) = \frac{\sqrt{x-6}}{x(x-8)}.$$

- (a)  $[6, 8) \cup (8, \infty)$                       (b)  $[6, \infty)$                       (c)  $(8, \infty)$                       (d)  $(-\infty, 0) \cup (0, 8) \cup (8, \infty)$                       (e)  $(-\infty, \infty)$

**Part 1.** (cont.) Complete the table by blacking out letters matching correct answers.

6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

6. Find the *range* of the function  $f(x) = \sqrt{6 - 9x}$ .

- (a)  $(-\infty, \infty)$       (b)  $(-\infty, 0]$       (c)  $[2/3, \infty)$       (d)  $(-\infty, 2/3]$       (e) none of these

7. Which function(s) has its domain identical with its range? (select all that apply)

- (a)  $f(x) = 1/x$       (b)  $g(x) = x$       (c)  $h(x) = x^2$       (d)  $i(x) = \sqrt{x}$       (e) none of these

8. Simplify the expression  $|\sqrt{3} - 1| + |8 + \sqrt{3}|$ .

- (a)  $7 + 2\sqrt{3}$       (b)  $2\sqrt{3}$       (c)  $9 + 2\sqrt{3}$       (d)  $-2\sqrt{3}$       (e) none of these

9. The equation of the line that passes through the points  $(2, 6)$  and  $(3, 13)$  is

- (a)  $y = \frac{1}{7}x + \frac{8}{7}$       (b)  $y = -\frac{1}{7}x + \frac{20}{7}$       (c)  $y = -7x + 20$       (d)  $y = 7x - 8$       (e) none of these

10. Find the set of all  $x$  values where the function  $f(x)$  is continuous.

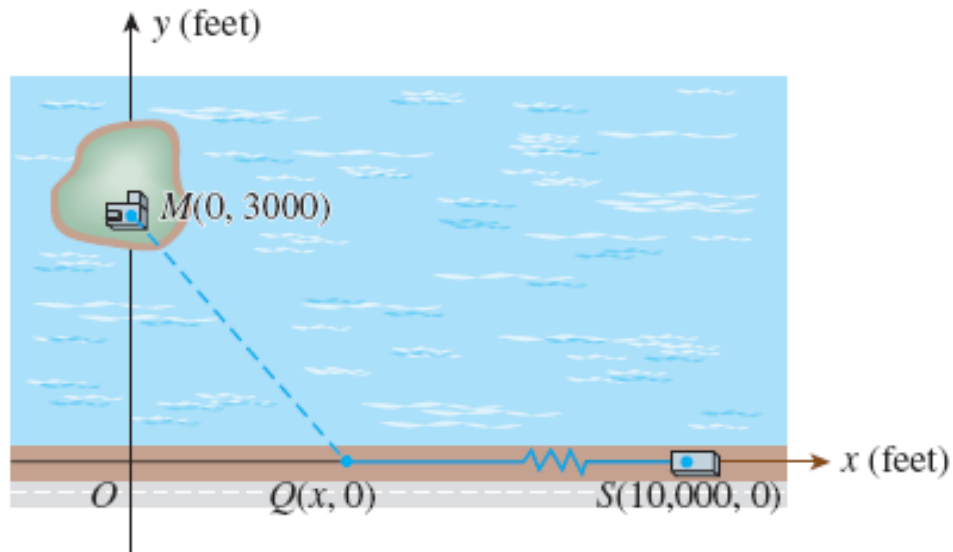
$$f(x) = \frac{x^2 - 4}{x - 2}$$

- (a)  $(-\infty, \infty)$       (b)  $(-\infty, -2)$       (c)  $(2, \infty)$       (d)  $(-\infty, 2) \cup (2, \infty)$       (e) none of these

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

**Part 2.**

11. In the following diagram,  $S$  represents the position of a power relay station located on a straight coastal highway, and  $M$  shows the location of a marine biology experimental station on an island. A cable is to be laid connecting the relay station with the experimental station. The cost of running the cable on land is \$3/running foot and the cost of running cable under water is \$5/running foot.



- i. (4pts) Find an expression in terms of  $x$  that gives the total cost of laying the cable.

**Answer:**  $C(x) =$  \_\_\_\_\_

- ii. (3pts) What is the total cost when  $x = 4,000$ ?

**Answer:**  $C(4000) =$  \_\_\_\_\_

**12.** (15pts) Evaluate each limit. If the limit does not exist, write DNE. (Show your work!)

**i.**

$$\lim_{x \rightarrow 2} \frac{2x^2 + 1}{x^2 + 5x - 4}$$

**Answer:** \_\_\_\_\_

**ii.**

$$\lim_{x \rightarrow -1} \frac{x^2 - 4x}{x^2 - 3x - 4}$$

**Answer:** \_\_\_\_\_

**iii.**

$$\lim_{x \rightarrow -2} \frac{x^2 + 4x + 4}{x^4 - 16}$$

**Answer:** \_\_\_\_\_

**iv.**

$$\lim_{y \rightarrow \infty} \frac{1 - 3y^2}{2y^2 + 5y}$$

**Answer:** \_\_\_\_\_

**v.**

$$\lim_{x \rightarrow \infty} (x - \sqrt{x^2 + 6x})$$

**Answer:** \_\_\_\_\_

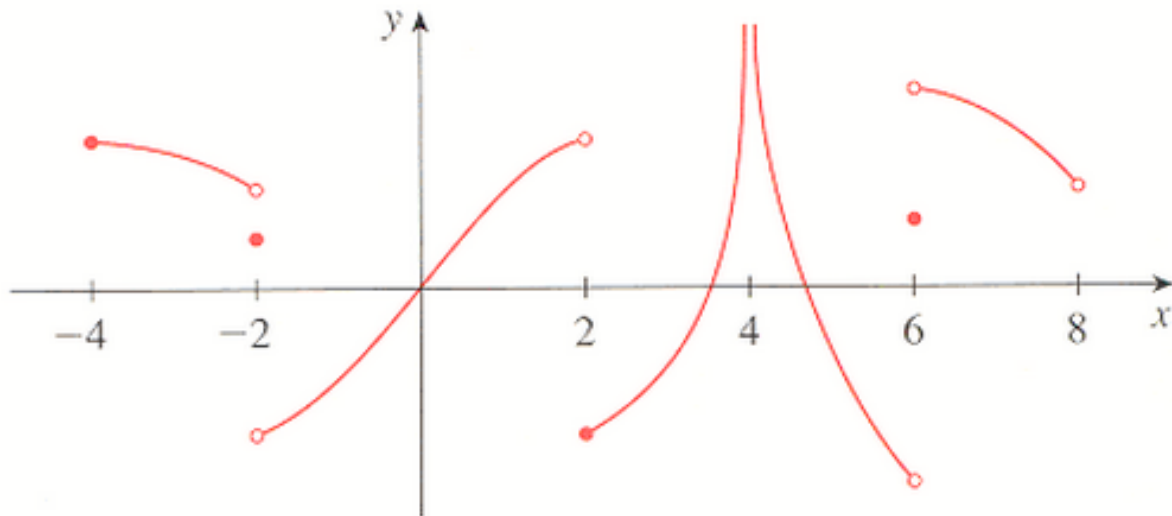
Name: \_\_\_\_\_

13. (4pts) For what value of  $k$  will the function  $f$  be continuous on  $(-\infty, \infty)$ ? (You must justify your answer and show your work in order to receive credit on this problem.)

$$f(x) = \begin{cases} \frac{x^2-16}{x+4}, & \text{if } x \neq -4, \\ k, & \text{if } x = -4. \end{cases}$$

Answer:  $k =$  \_\_\_\_\_

14. (4pts) Consider the graph of a function shown below. Identify the domain of the function and the set of values at which the function is continuous. (Circle letters next to correct answers.)



The **domain** of the function:

- (a)  $[-4, 8]$
- (b)  $[-4, 4) \cup (4, 8]$
- (c)  $(-\infty, -4) \cup [8, \infty)$
- (d)  $[-4, -2) \cup (-2, 2) \cup [2, 6) \cup (6, 8]$
- (e)  $[-4, -2) \cup (-2, 2) \cup (2, 4) \cup (4, 6) \cup (6, 8)$

$x$  values where the function is **continuous**:

- (a)  $[-4, 8]$
- (b)  $[-4, 4) \cup (4, 8]$
- (c)  $(-\infty, -4) \cup [8, \infty)$
- (d)  $[-4, -2) \cup (-2, 2) \cup [2, 6) \cup (6, 8]$
- (e)  $[-4, -2) \cup (-2, 2) \cup (2, 4) \cup (4, 6) \cup (6, 8)$

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“On my honor as a student I, \_\_\_\_\_, have neither given nor received unauthorized aid on this exam.” (print name clearly)

Signature: \_\_\_\_\_ Date: 2015-09-22

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(do not write below this line)

probs	page	max	score
1–5.	1	15	
6–10.	2	15	
11.	3	7	
12.	4	15	
13, 14.	5	8	
	Total	60	