

Do not remove this answer page — you will turn in the entire exam. You have two hours to do this exam. No books or notes may be used. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of multiple choice and short answer questions. Record your answers on this page. For each multiple choice question, you will need to fill in the box corresponding to the correct answer. For example, if (c) is correct, you must write

a b c d e

Do not circle answers on this page, but please do circle the letter of each correct response in the body of the exam. It is your responsibility to make it CLEAR which response has been chosen. You will not get credit unless the correct answer has been marked on both this page and in the body of the exam.

GOOD LUCK!

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For grading use:

Total	
	(out of 100 pts)

Multiple Choice Questions

*Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.*

1. Choose the correct symmetry for the equation $x^2 + (y - 5)^2 = 4$

Possibilities:

- (a) The graph does not display any symmetry.
 - (b) The graph is only symmetric about the both the x -axis and the y -axis.
 - (c) The graph is only symmetric about the origin.
 - (d) The graph is only symmetric about the x -axis.
 - (e) The graph is only symmetric about the y -axis.
-

2. The graph of $x^2 - 16x + 40 + y^2 + 10y = 0$ is a circle. Find its center and its radius.

Possibilities:

- (a) Center: $(-8, 5)$ Radius: 7
 - (b) Center: $(8, -5)$ Radius: 7
 - (c) Center: $(16, -10)$ Radius: 40
 - (d) Center: $(-16, 10)$ Radius: 40
 - (e) Center: $(8, -5)$ Radius: 49
-

3. Suppose you need to solve a system of equations in which one equation is $y = |x|$ and the other equation represents a line. How many solutions could your system have?

Possibilities:

- (a) The system could only have 0, 1, 2, or infinitely many solutions.
 - (b) The system could only have 0, 1, or 2 solutions.
 - (c) The system could only have 1 or 2 solutions.
 - (d) The system could only have 0, 1, or infinitely many solutions.
 - (e) The system will never have any solutions because the graph of $y = |x|$ is not a line.
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4. Let $f(x) = x^2 + 3x - 10$. Find the y -intercept(s) of the graph of $f(x)$.

Possibilities:

- (a) Both $(-2, 0)$ and $(5, 0)$
- (b) Only $(-10, 0)$
- (c) Both $(2, 0)$ and $(-5, 0)$
- (d) Both $(0, 2)$ and $(0, -5)$
- (e) Only $(0, -10)$

5. Which of the following are equations for the line through the points $P(4, 10)$ and $Q(5, 12)$?

(I) $y = 2x + 6$ (II) $y + 12 = 2(x - 5)$ (III) $y - 10 = 2(x - 4)$

Possibilities:

- (a) Only (III).
- (b) Only (II).
- (c) Only (I) and (II).
- (d) Only (I).
- (e) Only (II) and (III).

6. A chemist has two large containers of salt solution. The concentration of the salt is different in the two containers. She blends 200 mL of the first solution with 200 mL of the second solution to obtain a solution with concentration 60g/ml. She blends 100 mL of the first solution with 400 mL of the second solution to obtain a solution with concentration 72g/ml. What are the concentrations of the original solutions?

Possibilities:

- (a) First Solution: 45g/mL Second Solution: 75g/mL
- (b) First Solution: 35g/mL Second Solution: 110g/mL
- (c) First Solution: 50g/mL Second Solution: 100g/mL
- (d) First Solution: 80g/mL Second Solution: 40g/mL
- (e) First Solution: 40g/mL Second Solution: 80g/mL

7. Which of the following equations are linear equations?

(I) $y - 2 = x + 3$

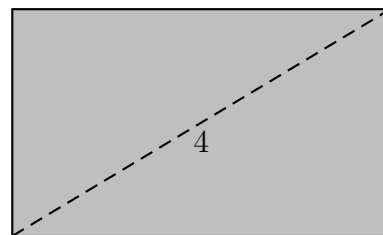
(II) $y = (\sqrt{2})x$

(III) $y = \sqrt{2x}$

Possibilities:

- (a) Only equations (I) and (II) are linear
- (b) Only equation (I) is linear.
- (c) None of the equations are linear.
- (d) Only equations (II) and (III) are linear
- (e) All of the equations are linear.

8. A rectangle has an area of 20 square feet and a **diagonal** of 4 feet. Which system of equations would you solve to find the length l and width w of the rectangle?



Possibilities:

- (a) $\begin{cases} 2lw = 20 \\ l + w = 4 \end{cases}$
- (b) $\begin{cases} lw = 20 \\ l^2 + w^2 = 16 \end{cases}$
- (c) $\begin{cases} lw = 20 \\ 2l^2 + 2w^2 = 16 \end{cases}$
- (d) $\begin{cases} 2l + 2w = 20 \\ l^2 + w^2 = 16 \end{cases}$
- (e) $\begin{cases} lw = 20 \\ 2l + 2w = 4 \end{cases}$

9. Express the rule "Square then add 8" as a function f of the variable x .

Possibilities:

- (a) $f(x) = x^2 + 8$
- (b) $f(x) = (x + 8)^2$
- (c) $f(x) = x^2 + x + 8$
- (d) $f(x) = x + 64$
- (e) $f(x) = x^2 + 64$

10. Let $f(x) = \sqrt[3]{9-x}$. Find the domain of $f(x)$.

Possibilities:

- (a) $(-\infty, 9]$
- (b) $(-\infty, 9)$
- (c) $(-9, \infty)$
- (d) $(-\infty, \infty)$
- (e) $[-9, \infty)$

11. Let $f(x) = x^2 + 7x$. Find $\frac{f(x+h) - f(x)}{h}$ if $h \neq 0$.

Possibilities:

- (a) $\frac{h^2 + 7h}{h}$
- (b) $2x + h + 7$
- (c) $h^2 + 7h$
- (d) $-2x - h - 7$
- (e) $\frac{2xh + h^2 + 14x + 7h}{h}$

12. A soccer ball is on the ground. A child kicks the ball straight up in the air. Four seconds later, the ball lands on a building that is 28 feet high. What is the average velocity of the ball from the time it was kicked to the time it landed on the building?

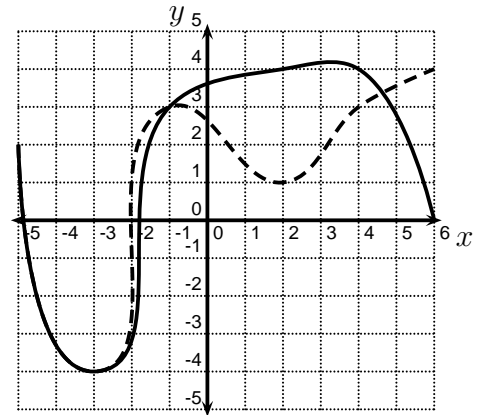
Possibilities:

- (a) 14 ft/s
 - (b) $\frac{1}{14}$ ft/s
 - (c) 0 ft/s
 - (d) 7 ft/s
 - (e) $\frac{1}{7}$ ft/s
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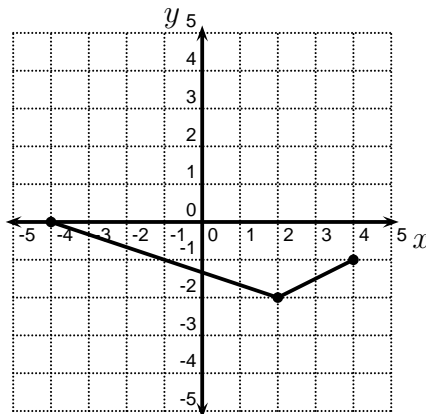
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13. In the picture below, the graph of $y = f(x)$ is the solid graph, and the graph of $y = g(x)$ is the dashed graph. Find the true statement.

Possibilities:

- (a) $f(2) < g(2)$
- (b) $f(-1) = 2$
- (c) $f(4) = 3$
- (d) $f(2) > g(2)$
- (e) $f(-1) > g(-1)$



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14. The graph of $y = f(x)$ is shown below. Find the maximal interval on which f is increasing.



Possibilities:

- (a) $[2, 4]$
- (b) $[-4, 4]$
- (c) $[-2, 0]$
- (d) $[-4, 2]$
- (e) Never Increasing

Short Answer Questions

Clearly write your answers in the spaces provided on the following pages.

15. Find an equation for the line that is perpendicular to $y = \frac{3}{7}x + 9$ and passes through the point (1,8).

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16. Let

$$f(x) = \begin{cases} |x + 1| & \text{if } x \leq -3 \\ x + 5 & \text{if } x > -3 \end{cases}$$

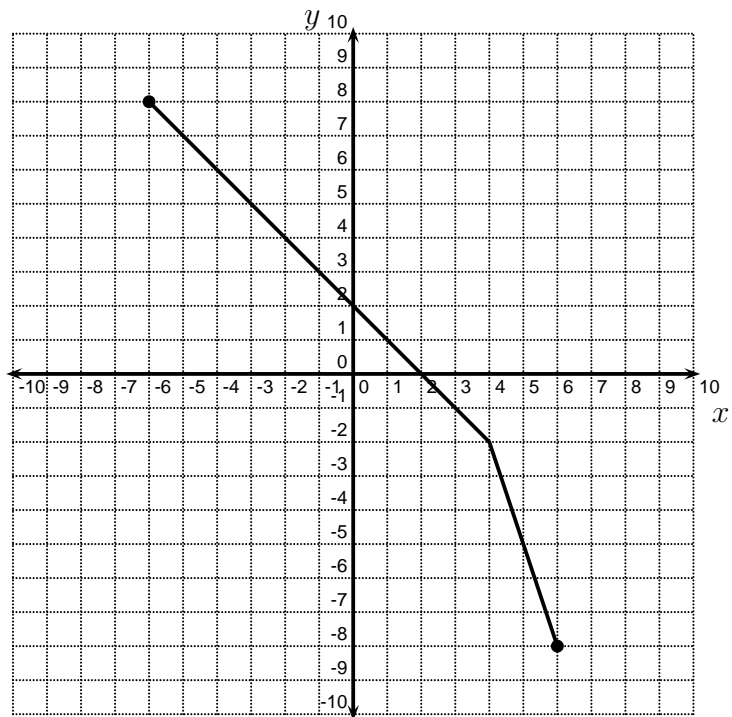
Find $f(6)$.

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17. Find an equation for the line through the points $(-10, 3)$ and $(14, 9)$.
-

18. Find all the solutions of the system of equations, or state that there are no solutions.

$$\begin{cases} 9x + 4y = -7 \\ 10x + 4y = -7 \end{cases}$$

19. The graph of the function f is shown below. Find the range of f .



20. Let $f(x) = |x + 9|$. Find the average rate of change of $f(x)$ from $x = 4$ to $x = -4$.
