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a  b  c  d  e

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**GOOD LUCK!**

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|---|---|
| 3. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e  | 12. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 4. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e  | 13. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 5. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e  | 14. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 6. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e  | 15. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 7. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e  | 16. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
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| 11. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e | 20. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |

For grading use:

Multiple Choice	Short Answer
(number right) (5 points each)	(out of 10 points)

Total	
	(out of 100 points)

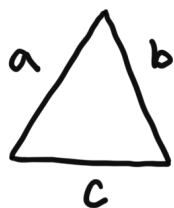
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### Short Answer Questions

Each question is an opportunity to earn 5 points. Points are earned on the clarity and correctness of your explanation, not merely on having a correct answer somewhere.

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1. The perimeter of a triangle is 61 inches. The second side is 7 inches more than twice the first side, and the third side is 12 inches less than three times the first side. Find the lengths of the three sides of the triangle.



$$\begin{aligned} \textcircled{1} P &= a + b + c = 61 && \rightarrow && a + (2a + 7) + (3a - 12) = 61 \\ \textcircled{2} b &= 2a + 7 && && 6a - 5 = 61 \\ \textcircled{3} c &= 3a - 12 && && 6a = 66 \\ &&& && a = 11 \end{aligned}$$

$$\begin{aligned} \text{So } a &= 11 \\ b &= 2 \cdot 11 + 7 = 29 \\ c &= 3 \cdot 11 - 12 = 21 \end{aligned}$$

- 
2. Given the function  $f(x) = 3x^2 + 2x - 6$ , evaluate and simplify  $f(x + 1)$ .

$$\begin{aligned} f(x+1) &= 3(x+1)^2 + 2(x+1) - 6 \\ &= 3(x+1)(x+1) + 2x + 2 - 6 \\ &= 3(x^2 + 2x + 1) + 2x + 2 - 6 \\ &= 3x^2 + \underline{6x} + \underline{3} + \underline{2x} + \underline{2} - 6 \\ &= 3x^2 + 8x - 1 \end{aligned}$$

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### 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.*

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3. The point  $(13, 3)$  is on the graph of which of these equations?

**Possibilities:**

- (a)  $(y + x)^2 = (3)^2 + (13)^2$
  - (b)  $y = 13x + 3$
  - (c)  $y = 7x - 85$
  - (d)  $13y = 3x$
  - (e)  $y + 3 = 7(x + 13)$
- 

4. A line has slope 3 and goes through the point  $(17, 7)$ . What is its  $y$ -intercept?

**Possibilities:**

- (a)  $-51$
  - (b)  $-10$
  - (c)  $-44$
  - (d)  $7$
  - (e)  $44$
- 

5. Let

$$p(x) = \begin{cases} 7 & \text{if } x \leq 1 \\ 11x & \text{if } 1 < x < 3 \\ 5x + 1 & \text{if } x \geq 3 \end{cases}$$

Find  $p(3)$

**Possibilities:**

- (a)  $7$
  - (b)  $5x + 1$
  - (c)  $33$
  - (d)  $16$
  - (e)  $49$
-

---

6. Find the slope of the line through  $(8, 3)$  and  $(5, 2)$ .

**Possibilities:**

(a)  $m = -3$

(b)  $m = \frac{1}{3}$

(c)  $m = 3$

(d)  $m = -\frac{1}{3}$

(e)  $m = \frac{3}{5}$

---

7. Let  $f(x) = 11x + 5$ . Compute  $3f(2)$ .

**Possibilities:**

(a) 81

(b) 71

(c) 11

(d) 76

(e) 66

---

8. Let  $f(x) = x^2 + 11$ . Compute  $f(x + h)$ .

**Possibilities:**

(a) 11

(b)  $x^2 + h^2 + 11$

(c)  $x^2 + h^2 + 22$

(d)  $x^2 + h + 11$

(e)  $x^2 + 2hx + h^2 + 11$

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9. Including 8% sales tax, an inn charges \$140 per night. Find the nightly cost at the inn before tax is added. Write an equation to model the problem. Let  $x$  represent the nightly cost before tax.

**Possibilities:**

(a)  $x = \frac{140 + (1 + 0.08)}{2}$

(b)  $(1 + 0.08)x = 140$

(c)  $x + 0.08 = 140$

(d)  $(1 + 0.08) + x = 140$

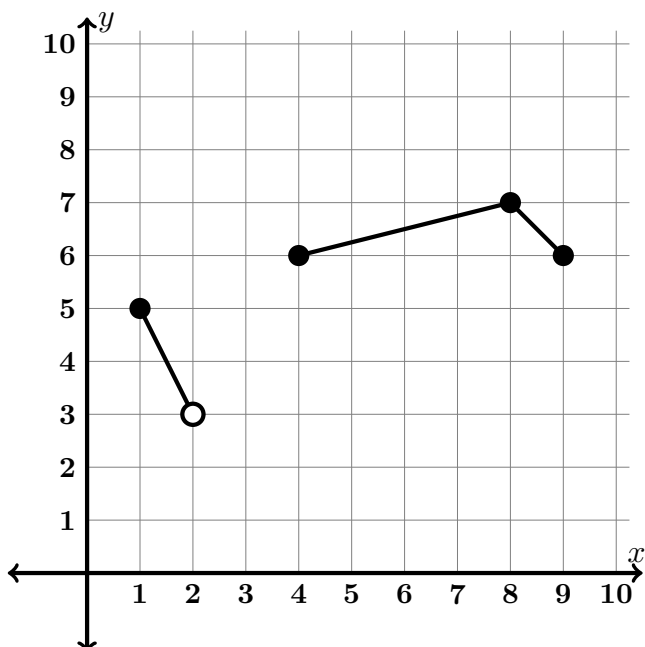
(e)  $(1 + 0.08)140 = x$

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10. What is the domain of the function in the graph?

**Possibilities:**

- (a)  $[3, 5] \cup [6, 7]$
- (b)  $[2, 3] \cup (8, 7]$
- (c)  $[1, 2) \cup [4, 9]$
- (d)  $(-\infty, 2) \cup (2, \infty)$
- (e)  $[1, 5] \cup (9, 6]$

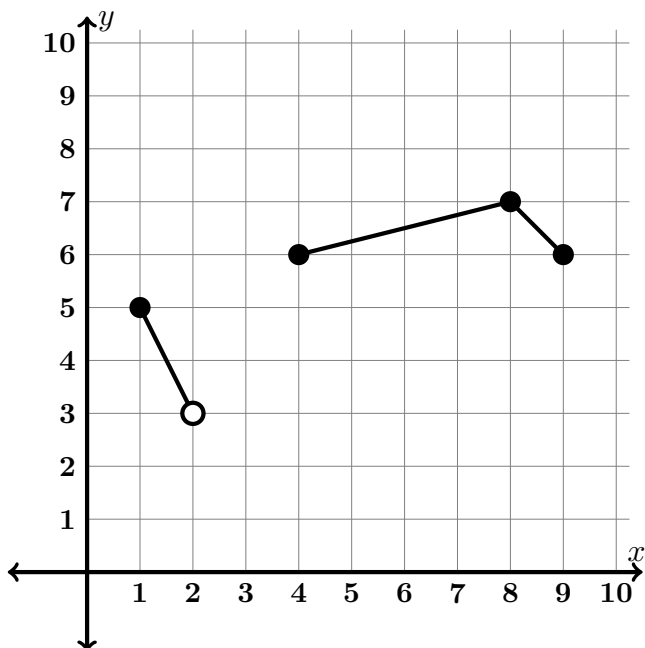


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11. What is the range of the function in the graph?

**Possibilities:**

- (a)  $[2, 3] \cup (8, 7]$
- (b)  $(3, 5] \cup [6, 7]$
- (c)  $[1, 2) \cup [4, 9]$
- (d)  $(-\infty, 2) \cup (2, \infty)$
- (e)  $[1, 5] \cup (9, 6]$



- 
12. At a “university mixer,” there is a room full of 80 people, either first-year students or returning students. Currently,  $\frac{1}{2}$ , that is 50%, of them are first-year students, and the rest are returning students. How many more returning students would need to enter the room so that first-year students make up only  $\frac{1}{5}$ , that is 20%, of the resulting mixture of people?

**Possibilities:**

- (a) 64 returning students
- (b) 40 returning students
- (c) 120 returning students
- (d) 24 returning students
- (e) 16 returning students

- 
13. Which of these equations says “ $x$  is the number where  $(6, 3)$  is the midpoint of  $(x, 4)$  and  $(5, 2)$ ”?

**Possibilities:**

- (a)  $\frac{3}{6} = \frac{2-4}{5-x}$
- (b)  $(6)^2 + (3)^2 = (x-4)^2 + (5-2)^2$
- (c)  $x = \frac{2-3}{5-6}$
- (d)  $6 = \frac{x+5}{2}$
- (e)  $6 = x - 5$

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14. Find the domain of  $\frac{1}{\sqrt{81-x}}$  in interval notation.

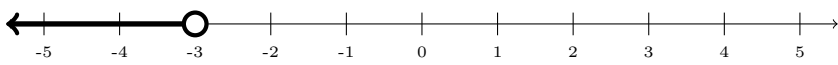
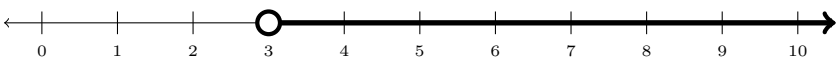
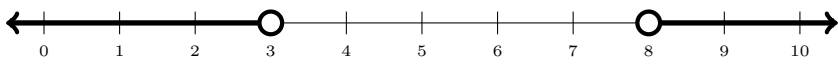
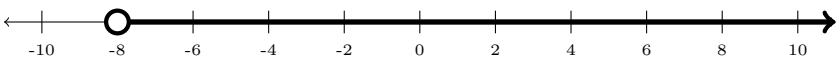
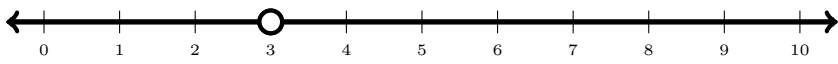
**Possibilities:**

- (a)  $(9, \infty)$
- (b)  $(-\infty, 9)$
- (c)  $(-\infty, \infty)$
- (d)  $(-\infty, 81)$
- (e)  $(81, \infty)$

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15. Find the domain of  $f(x) = \frac{8}{3-x}$ .

**Possibilities:**

- (a) 
- (b) 
- (c) 
- (d) 
- (e) 



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16. Find  $k$  if the line through  $(9, 4)$  and  $(7, k)$  has slope  $m = \frac{3}{2}$ .

**Possibilities:**

- (a)  $k = 8$
- (b)  $k = 1$
- (c)  $k = 2$
- (d)  $k = -3$
- (e)  $k = -6$

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17. Solve  $6x + 7 \geq 8x - 5$

**Possibilities:**

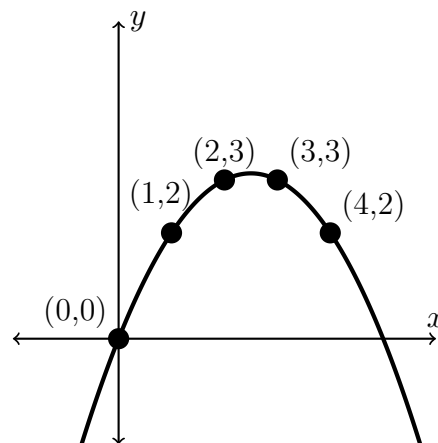
- (a)  $(-\infty, 6]$
  - (b)  $(-\infty, -6) \cup (-6, \infty)$
  - (c)  $[-6, \infty)$
  - (d)  $(-\infty, -6)$
  - (e)  $(6, \infty)$
-

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18. The graph on the right defines  $y$  as a function of  $x$ . An input of 2 results in what output?

**Possibilities:**

- (a)  $y = 3$
- (b)  $y = 1$
- (c)  $y = 4$
- (d)  $y = 2$
- (e)  $y = 0$



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19. The graph from #18 defines  $y$  as a function of  $x$ . What input(s) result in an output of 2?

**Possibilities:**

- (a)  $x = 0$  only
- (b)  $x = 2$  only
- (c)  $x = 2$  and  $x = 3$
- (d)  $x = 3$  only
- (e)  $x = 1$  and  $x = 4$

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20. Let  $f(x) = 2x - 3$  and solve  $f(x) = 5$ .

**Possibilities:**

- (a)  $x = -3$
  - (b)  $x = \frac{3}{2}$
  - (c)  $x = 4$
  - (d)  $x = 5$
  - (e)  $x = 7$
-

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Right	Grade	Wrong
18	90	0
17	85	1
16	80	2
15	75	3
14	70	4
13	65	5
12	60	6
11	55	7
10	50	8
9	45	9
8	40	10
7	35	11
6	30	12
5	25	13
4	20	14
3	15	15
2	10	16
1	5	17
0	0	18

GOOD LUCK!

- 3.  a  b  c  d  e
- 4.  a  b  c  d  e
- 5.  a  b  c  d  e
- 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
- 11.  a  b  c  d  e

- 12.  a  b  c  d  e
- 13.  a  b  c  d  e
- 14.  a  b  c  d  e
- 15.  a  b  c  d  e
- 16.  a  b  c  d  e
- 17.  a  b  c  d  e
- 18.  a  b  c  d  e
- 19.  a  b  c  d  e
- 20.  a  b  c  d  e

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(number right) (5 points each)	(out of 10 points)

Total	
	(out of 100 points)