

College Algebra Spring 2013  
Chapters 3 and 4 Practice Test

**NON-CALCULATOR:**

**I. Use the square root method to solve the equation. Leave answer in simplified radical form or simplified form.**

1.  $2z^2 - 72 = 0$
2.  $(x - 5)^2 = 19$

**II. Answer the following questions:** a) state the vertex of the function

b) identify any maxima and minima

c) identify the axis of symmetry

d) state the domain

e) state the range

f) state the intervals in which  $f$  is increasing and/or decreasing

3.  $f(x) = -2x^2 - 16x - 26$

4.  $f(x) = \frac{1}{2}x^2 - 2x + 5$

**III. Write the vertex form of the parabola that satisfies the given conditions.**

5. Vertex =  $(-3, 4)$  and passing through the point  $(2, 9)$

6. Vertex =  $(-1, -5)$  and passing through the point  $(-4, -14)$

**IV. Determine algebraically whether the given function is even, odd, or neither.**

7.  $g(x) = 4x + x^2$

8.  $f(x) = \frac{1}{2}x^3 - x$

9.  $g(x) = \sqrt{x^2 + 3}$

**V. Use the given function to complete the following. Be able to use any of the basic functions.**

a) Sketch the graph

b) Identify the domain

c) Identify the range.

10.  $f(x) = -3 + \sqrt{x + 2}$

11.  $f(x) = \frac{1}{x}$

12.  $f(x) = \frac{1}{x} + 4$

**VI. Sketch a graph of the function, then evaluate at the given values.**

$$13. f(x) = \begin{cases} x + 3 & \text{if } x > 4 \\ -5 & \text{if } -3 < x \leq 4 \\ 1 - x & \text{if } x \leq -3 \end{cases}$$

a)  $f(2) =$

b)  $f(11) =$

c)  $f(-7) =$

**VII. Write the equation of the graph after the indicated transformations.**

14. Starting with the basic absolute value function, the graph is reflected over the x-axis, shifted horizontally left by 3 units, shifted vertically down by 8 units and compressed by a factor of 0.6.

College Algebra Spring 2013  
Chapters 3 and 4 Practice Test

**CALCULATOR ALLOWED:**

**VIII. Solve the following problems.**

15. John owns a hot dog stand. He has found that his profit is given by the equation  $P = -x^2 + 50x + 74$ , where  $x$  is the number of hot dogs sold.
- How many hot dogs must he sell to earn the most profit?
  - What is that profit?
16. The percent of US population that is foreign born can be modeled by the function  $P(x) = 0.003x^2 - 0.42x + 19.8$ , where  $x$  is the number of years after 1900.
- What is the percent of US population that is foreign born in 1967?
  - What year(s) was the percent of US population foreign born 7.8?
17. Assume that the elevation  $E$ , in feet, of a sag in a proposed route is given by  $E(x) = 0.000035x^2 - 0.3x + 1400$ , where  $x$  represents the horizontal distance in feet along the proposed route and  $0 \leq x \leq 5000$ . For what **x-values** is the elevation 1250 feet or more? Round your answer to the nearest foot. Hint: write a quadratic inequality, then solve it.
18. A ball is thrown upward at 96 feet per second from the top of a building that is 100 feet high. Using the function,  $h(t) = -16t^2 + v_0t + h_0$ , with the appropriate substitutions, answer the following questions. If necessary round to the nearest hundredths.
- Write the appropriate function.
  - Determine the time it takes the ball to attain its maximum height.
  - Determine the maximum height the ball attains.
  - Determine the time it takes the ball to hit the ground.
19. The Mad Hatter is ordering cups from Teacups, Limited, for his tea party. The Teacups, Limited catalog prices cups according to the number of cups ordered. For orders of 20 or fewer cups, the price is \$1.40 per cup plus \$12 shipping and handling on the order. For orders of more than 20 cups, the price is \$1.10 per cup plus \$15 shipping and handling.
- Write a piecewise-defined function that represents Teacups, Limited cup prices.
  - How much will The Mad Hatter owe if he orders 15 teacups?
  - How many teacups did The Mad Hatter order if the cost was \$44.70?
20. The number of high school students who have ever used marijuana for the years 1990 through 2006 is given by  $y = -0.1940x^2 + 4.0142x + 27.861$ , where  $x$  is the number of years from 1990. Use the model to estimate the years when the percent who ever used marijuana is greater than 42.4%.

**IX. Solve the inequalities. Write answer in interval notation.**

21.  $x^2 - 6x \geq -8$   
22.  $x^2 + 17x \leq 8x - 14$

**X. Use the quadratic formula to solve the equation. Leave answer in simplified radical form.**

23.  $z^2 + 18z + 60 = 0$   
24.  $5n^2 = -12n - 5$

College Algebra Spring 2013  
 Chapters 3 and 4 Practice Test

**XI. Sketch a graph of the function, then evaluate at the given values.**

25. As part of a water conservation program, the public water company in Arid, New Mexico establishes a three tier system for monthly bills based on use of hundred cubic feet of water usage. Where  $x$  is the number of hundred cubic feet a household uses.

$$f(x) = \begin{cases} 50 + 2x & \text{if } x \leq 50 \\ 50 + 3.5x & \text{if } 50 < x \leq 110 \\ 50 + 5.75x & \text{if } x > 110 \end{cases}$$

- a)  $f(132)$    b)  $f(37)$    c)  $f(68)$

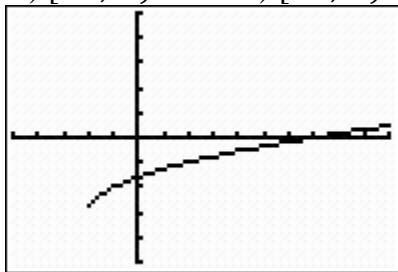
**XII. Use the function, to answer the following:**

26.  $f(x) = x^2 - 9x + 18$

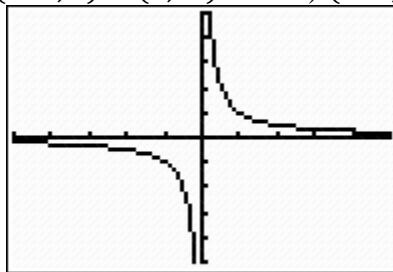
- Use the discriminant to determine the number and type of solutions of the quadratic equation.
- Determine the concavity of  $f(x)$ .
- Find the vertex of  $f(x)$ .
- Find the axis of symmetry.
- Find the x-intercept(s), and write the intercept(s) as ordered pair(s).
- Find the y-intercept.
- State the domain of the function.
- State the range of the function.
- Sketch a graph of the parabola using the information obtained in the parts above.

**Answers:**

- $z = \pm 6$
- $x = 5 \pm \sqrt{19}$
- a)  $(-4, 6)$    b)  $Max = (-4, 6)$    c)  $x = -4$    d)  $(-\infty, \infty)$    e)  $(-\infty, 6]$   
 f) *Increasing*  $(-\infty, -4)$ ; *decreasing*  $(-4, \infty)$
- a)  $(2, 3)$    b)  $Min = (2, 3)$    c)  $x = 2$    d)  $(-\infty, \infty)$    e)  $[3, \infty)$   
 f) *Increasing*  $(2, \infty)$ ; *decreasing*  $(-\infty, 2)$
- $y = \frac{1}{5}(x + 3)^2 + 4$
- $y = -(x + 1)^2 - 5$
- Neither
- Odd
- Even
- b)  $[-2, \infty)$    c)  $[-3, \infty)$

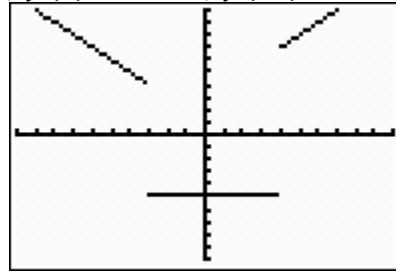
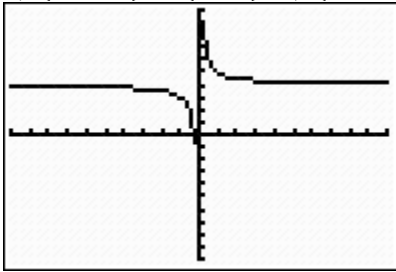


- b)  $(-\infty, 0) \cup (0, \infty)$    c)  $(-\infty, 0) \cup (0, \infty)$



College Algebra Spring 2013  
 Chapters 3 and 4 Practice Test

12. b)  $(-\infty, 0) \cup (0, \infty)$  c)  $(-\infty, 4) \cup (4, \infty)$  13. a)  $f(2) = -5$  b)  $f(11) = 14$  c)  $f(-7) = 8$



14.  $f(x) = -0.6|x + 3| - 8$   
 15. a) John needs to sell 25 hot dogs for maximum profit.  
 b) The maximum profit is \$699.  
 16. a) In 1967, the percent of US population that is foreign born was 5.127%  
 b) In the years 1940 and 2000, the percent of US population that is foreign born was 7.8%  
 17. We need a horizontal distance of less than 533 feet.  
 18. a)  $h(t) = -16t^2 + 96t + 100$   
 b) 3 seconds c) 340 feet d) 6.91 seconds  
 19. a)  $f(x) = \begin{cases} 1.40x + 12, & \text{if } x \leq 20 \\ 1.10x + 15, & \text{if } x > 20 \end{cases}$   
 b) \$33.00 c) 27 cups  
 20. From 1995 through 2006 the percent who ever used marijuana is greater than 42.4%.  
 21.  $(-\infty, 2] \cup [4, \infty)$   
 22.  $[-7, 2]$   
 23.  $z = -9 \pm \sqrt{21}$   
 24.  $n = \frac{-6}{5} \pm \frac{\sqrt{11}}{5}$   
 25. a) Your monthly bill will be \$809 for 132 cubic feet used. b) Your monthly bill will be \$124 for 37 cubic feet used. c) Your monthly bill will be \$288 for 68 cubic feet used.  
 26. a)  $b^2 - 4ac = 9 > 0$ , so 2 real solutions  
 b) concave up  
 c)  $(4.5, -2.25)$   
 d)  $x = 4.5$   
 e)  $(6, 0), (3, 0)$   
 f)  $(0, 18)$   
 g)  $(-\infty, \infty)$   
 h)  $[-2.25, \infty)$   
 i)

