Name: _____ Date: _____

Touchstone 3

1. What are the factors for the expression $x^2 - 6x + 5$?

A. $(x+1)(x+5)$ B. $(x+2)(x+3)$ C. $(x-1)(x-5)$ D. $(x-2)(x-3)$

2. Which of the following expressions below shows the complete factorization of the quadratic expression $2x^3 + 4x^2 - 6x$?

A. $(2x^2 - 2x)(x+3)$

B. $2x(x^2 + 2x - 3)$

C. $2x(x-1)(x+3)$

D. $2(x^3 + 2x^2 - 3x)$

3. Find the zeros of the equation $3x^2 + 9x = 0$.

A. x = 0 and x = 3

B. x = 0 and x = -3

C. x = 3 and x = -3

D. x = 3 and x = 9

4. What are the zeros of the function: $3x^2 - 40 = 7x$

A. x = -5 and x = $^8/_3$

B. x = 5 and x = - $^8/_3$

C. x = -15 and x = 8

D. x = -8 and x = 15

5 What are the solutions to the equation $2x^2 - 2x - 12 = 0$?

A. x = -4, x = 3 B. x = -3, x = 4 C. x = -2, x = 3 D. x = -6, x = 2

6. Find the solutions to the following equation: $x^2 - 2x - 4 = 0$

A. $x = 1 \pm \sqrt{3}$ B. $x = \frac{2 \pm \sqrt{3}}{2}$ C. $x = \frac{1 \pm 2\sqrt{5}}{2}$ D. $x = 1 \pm \sqrt{5}$

7. Find the zeros of the equation $x^2 - 100 = 0$

A. x = 10

B. x = 50

C. x = -10 and x = 10

D. x = -50 and x = 50

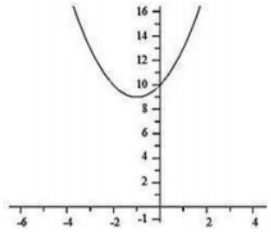
8. The volume of a cylinder is represented by the equation $V = \pi r^2 h$, where V is the volume of the cylinder, r is the radius of the base, and h is the height of the cylinder. Solve the equation in terms of r.

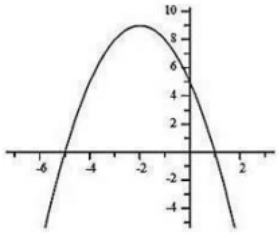
A. $r = \frac{V}{\pi h}$ B. $r = \frac{V\pi}{2h}$ C. $r = \sqrt{\frac{V}{\pi h}}$ D. $r = \sqrt{\frac{\pi h}{V}}$

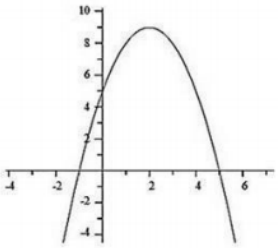
9. What is the value of the function $f(x) = x^2 - 5x + 2$ evaluated at x = 2?

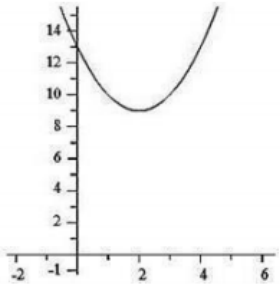
A. $f(2) = 16$ B. $f(2) = 6$ C. $f(2) = 2$ D. $f(2) = -4$

10. Determine which graph matches the characteristics of $f(x) = -x^2 - 4x + 5$

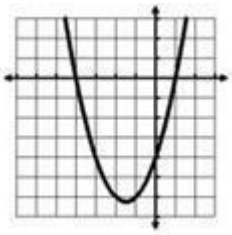
A. 

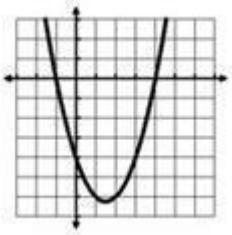
B. 

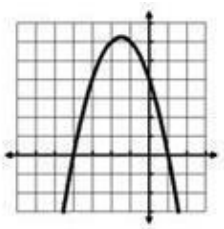
C. 

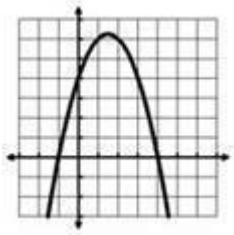
D. 

11. Which of the graphs below best represents the function $f(x) = (x + 4)(x - 1)$?

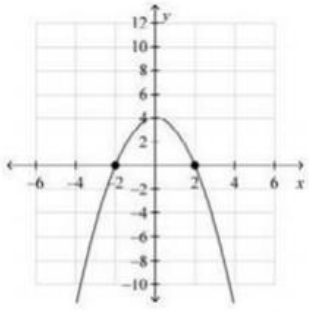
A. 

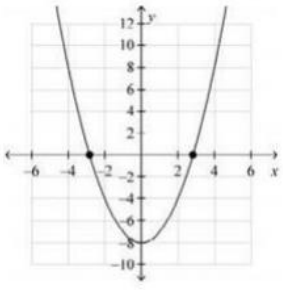
B. 

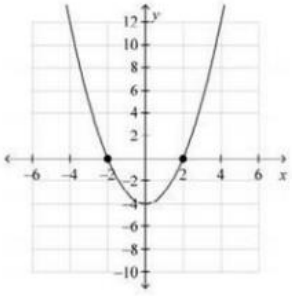
C. 

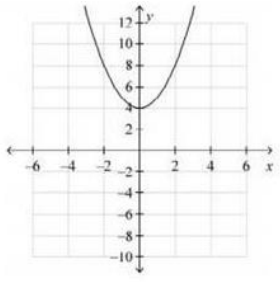
D. 

12. Which graph below shows the solutions to $x^2 + 2 = 6$?

A. 

B. 

C. 

D. 

13. How would you shift the parent function $y = x^2$ to graph the function $y = (x - 4)^2 + 5$?

A. The parent function would be shifted 4 units to the left and 5 units up.
B. The parent function would be shifted 4 units to the right and 5 units up.
C. The parent function would be shifted 5 units to the right and 4 units down.
D. The parent function would be shifted 5 units to the left and 4 units up.

14. The parent function $f(x) = x^2$ is reflected across the x-axis, vertically stretched by a factor of 4 and translated right 3 units to create $g(x)$. Use the description to write the quadratic function in vertex form.

A. $g(x) = 4(x + 3)^2$ B. $g(x) = 4(x - 3)^2$ C. $g(x) = -4(x - 3)^2$ D. $g(x) = -4(x + 3)^2$

15. Which function has its vertex below the x-axis?

A. $f(x) = (x-7)^2$ B. $f(x) = -2x^2$ C. $f(x) = -(x+3)^2$ D. $f(x) = x^2 - 8$

16. Describe the vertex of the function $f(x) = x^2 - 10x + 18$

A. Maximum at y = 93
B. Minimum at y = 93
C. Maximum at 7 = -7
D. Minimum at y = -7

17. Which of these is the result of completing the square for the expression $x^2 + 6x + 11$?

A. $(x + 3)^2 + 2$
B. $(x - 3)^2 + 2$
C. $(x + 2)^2 + 3$
D. $(x - 3)^2 + 3$

18. Which of the following functions has a line of symmetry of x = 2?

A. $y = (x - 2)^2 + 5$ B. $y = (x + 2)^2 - 5$ C. $y = (x - 5)^2 + 2$ D. $y = (x + 5)^2 - 2$

19. If the equation $x^2 - 12x - 9 = 0$ is converted to the form $(x - b)^2 = c$ and the resulting equation is $(x - 6)^2 = c$, what is the value of c?

A. 9 B. 27 C. 36 D. 45

20. Chris is completing the square to find the maximum or minimum of the function. What is the error in Chris' work?

Chris' Work:

Step 1: $x^2 + 18x - 29 = 0$
Step 2: $x^2 + 18x = 29$
Step 3: $(x + 81)^2 = 29 + 81$
Step 4: $(x + 81)^2 = 110$
Step 5: The minimum of the function is (-81, 110).

A. There is no error. Chris' wok is correct.

B. In Step 3, Chris completes the square incorrectly. He should have completed it as $(x+9)^2 = 29+81$.

C. In Step 4, Chris should have subtracted 81 from both sides to produce the equation $(x+9)^2 = -52$.

D. In Step 5, Chris completes the square correctly, but does not identify the correct coordinates for the minimum. The maximum is really (81, -110).

21. A manufacturer of jet engine harnesses has weekly production costs of $C = 0.25x^2 - 10x + 800$ where C is the total cost (in dollars) and x is the number of units produced. What is the average rate of change in the cost per unit as the manufacturer increases the weekly production from 500 to 600 units?

A. $583 per unit B. $265 per unit C. $848 per unit D. $274 per unit

22. Calculate the average rate of change of $f(x) = 4x^2 + 3x + 5$ on the interval [2,5].

A. 93 B. 31 C. 10 D. 7

23. A quadratic function models the population of a city where x represents the number of years since 2005 and f(x) is the population of the city in thousands of people. What is the estimated population of the city in 2010?

A. 2,215,000 B. 2,070,000 C. 1,095,000 D. 590,000

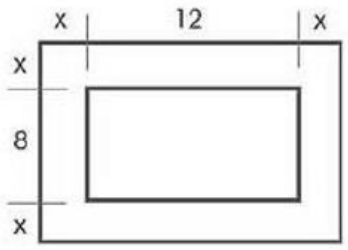
24. A missile is launched along a path determined by the equation $f(x) = -2x^2 + 72x$, where $f(x)$ is the height of the missile in feet x seconds after the launch. A plane is flying nearby at a height of 650 feet. Is the plane in danger? Why or why not?

A. Yes; the value of a is negative.
B. No; 650 is greater than $72x$
C. Yes; the missile reaches a height greater than 650 feet.
D. No; the missile does not reach a height of 650 feet.

25. A softball is thrown into the air with an initial velocity of 5 meters per second from a height of 9 meters. The equation $h(t) = -4.9t^2 + 5t + 9$ models the distance of the softball from the ground in meters after t seconds. How many seconds does it take for the softball to hit the ground?

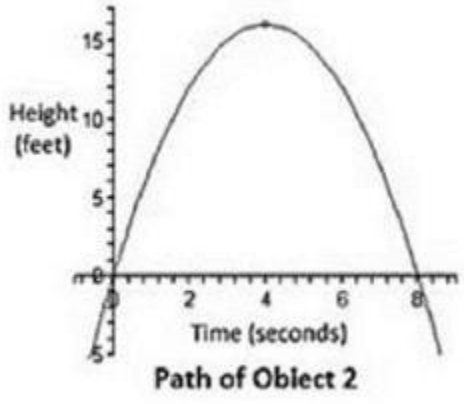
A. 0.94 seconds B. 1.77 seconds C. 1.96 seconds D. 5 seconds

26. A garden measuring 8 feet by 12 feet has a walkway around it. The walkway has a uniform width, and the area covered by the garden and walkway is 192 square feet. What is the width (x) of the walkway?



A. 2 feet
B. 3.5 feet
C. 4 feet
D. 6 feet

27. Two objects are launched from ground level at the same time. The height of Object 1 is represented by $h(t) = -3t^2 + 12t$. The graph shows the path of Object 2. Which object will reach maximum height first?

Object 1	Object 2
$h(t) = -3t^2 + 12t$	

A. Object 1
B. Object 2
C. They will reach maximum height at the same time.
D. There is not enough information to determine the answer.

28. Consider the graph. Which equation has a greater maximum value than the function in the graph?

A. $f(x) = -3(x + 1)^2 + 3$ B. $f(x) = -2(x - 1)^2 + 4$ C. $f(x) = -4(x - 6)^2 + 5$ D. $f(x) = -5(x - 3/2 + 7$

29. Use the equation $x^2 + 4x - 12 = 0$ for Parts A and B.

Part A: What is factored form of the equation? (NOTE: Your teacher will score your response to the question using a 2 point rubric.)

30. Use the equation $x^2 + 4x - 12 = 0$ for Parts A and B.

Part B: What are the zeros of the equation? Explain how you determined your answer algebraically. (NOTE: Your teacher will score your response to the question using a 2 point rubric.)