Algebra II
Chapter 5 Review - Quadratic Equations

Facts and steps in Chapter 5 (Look up in your notes & book)

1. How do you tell if a function is quadratic?
2. How do I tell if a parabola opens up or down?
3. What part of a parabola gives a maximum or minimum?
4. How do I find the vertex (as an ordered pair)?
5. How do I find the y-intercept of a parabola?
6. How do I find the x-intercept of a parabola?
7. What are the 2 types of factoring I use for quadratic expressions and how do I know which to use?
8. What is the difference between the instructions “Factor”, and “Solve by factoring”?
9. When I have a quadratic equation, what are 3 ways I can solve it?
10. How many solutions for x should I look for in a quadratic equation?
11. When should I solve by isolating $x^2$ and taking the square root? How do I get 2 answers?
12. When should I solve by factoring and what are the steps to solve by factoring?
13. When should I solve by using the quadratic formula?
14. What are the 2 imaginary number rules?
15. What is the discriminant?
16. How do I use the discriminant to determine how many solutions there are?
Review Problems

Simplify and determine whether each function is linear or quadratic.

1. \( y = 3x(x + 5) \)          2. \( y = 7(x - 2) - 3(5x) \)

Identify the vertex, the axis of symmetry, and maximum or minimum values.

3.  

4.  

5. A model for a company’s revenue is \( R = -15p^2 + 300p + 12,000 \), where \( p \) is the price in dollars of the company’s product. What price will maximize revenue? Find the maximum revenue. Explain.

6. The equation for the motion of a projectile fired straight up in the air is \( f(t) = 64t - 16t^2 \), where \( f(t) \) is height in feet and \( t \) is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go?
7. The equation for the cost in dollars of producing automobile tires is \( C = 0.000015x^2 - 0.03x + 35 \), where \( x \) is the number of tires produced. Find the number of tires that minimizes the cost. What is the cost for that number of tires? Explain your method.

8. In a circus act, a performer is shot out of a cannon. The height, in feet, he travels is given by the function \( H(t) = 120 + 48t - 6t^2 \), where \( t \) is the time in seconds. Find the vertex.
   A. What is the maximum height reached by the circus performer?
   B. At what time, \( t \), does he reach the maximum height?

Graph 9,10 by finding the vertex and 2 other points.

9. \( y = x^2 + 2x + 1 \) 
10. \( y = (x - 4)^2 + 3 \)

Identify the vertex of the graph of each function, and whether it opens up or down.

11. \( y = 4(x - 5)^2 + 1 \) 
12. \( y = -5(x + 2)^2 + 5 \)
Factor each of the following completely.

13. \( x^2 - 9x \) 
14. \( 8y^3 + 4y \)

15. \( 2x^2 - 6x - 20 \) 
16. \( x^2 - 10x + 25 \)

17. \( x^2 - 36 \) 
18. \( 9x^2 - 1 \)

Solve each equation by factoring or taking square roots.

19. \( x^2 - 6x - 7 = 0 \) 
20. \( 6x^2 = 12x \)

21. \( x^2 - 16 = 0 \) 
22. \( 2x^2 + 7x = -6 \)

23. \( 2x^2 + 144 = 0 \) 
24. \( 10x^2 + 90 = 0 \)
Simplify each expression.

25. \(-\sqrt{-64}\)  

26. \(\sqrt{-88}\)  

27. \((-2 + 3i) - (4 + 5i)\)  

28. \((3 + 4i)(1 - 2i)\)  

29. \(3i(4 - 13i)\)  

30. \((5 + 4i) + (-1 - 2i)\)  

31. \((4i)^2\)  

32. \(4i^2\)  

Find the discriminant \((b^2 - 4ac)\). Select the number and type of solutions.

33. \(y = -5x^2 + 6x - 4\)  
   Discriminant: ____________________________  
   
   _____2 real solutions  _____no real solutions (2 imaginary)  _____1 real solution  

34. \(y = x^2 + 12x + 36\)  
   Discriminant: ____________________________  
   
   _____2 real solutions  _____no real solutions (2 imaginary)  _____1 real solution  

35. \(y = 9x^2 - 24x\)  
   Discriminant: ____________________________  
   
   _____2 real solutions  _____no real solutions (2 imaginary)  _____1 real solution
Solve each equation by using the Quadratic Formula.

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

36. \( x^2 - 4x - 12 = 0 \)

37. \( x^2 - 5x + 2 \)

38. \( 3x^2 + 4x + 5 = 0 \)
39. A field hockey player hits the ball into the air when it is four feet off the ground. Its initial velocity is 90 feet per second. After it is hit for a specific amount of time, \( t \) (in seconds), the height \( h \) (in feet) of the ball can be modeled by the quadratic equation:

\[
h(t) = -16t^2 + 90t + 4
\]

a. When did the ball hit the ground in the field if no players interceded its path?

b. When did the ball hit another player’s stick if that player’s stick is 3 feet in the air?

c. How much time has elapsed when the ball reaches the maximum height?

d. How high did the ball reach at the maximum height?

40. The recommended dosage of a certain type of medicine is determined by the patient's body weight. The formula to determine the dosage is \( D = 0.1w^2 + 5w \), where \( D \) is the dosage in milligrams (mg) and \( w \) is the patient's body weight in kilograms. What is the maximum weight of a patient that you can treat with 1800 mg of this medicine?