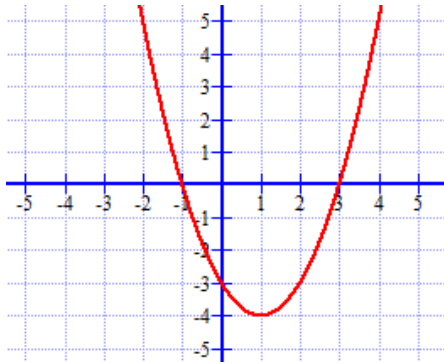


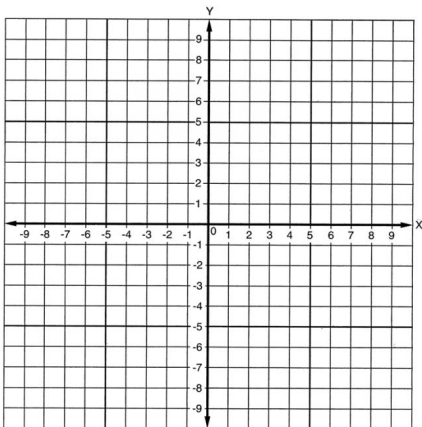
Example 1: Solve the following quadratic equation by making a graph: $x^2 - 2x - 3 = 0$



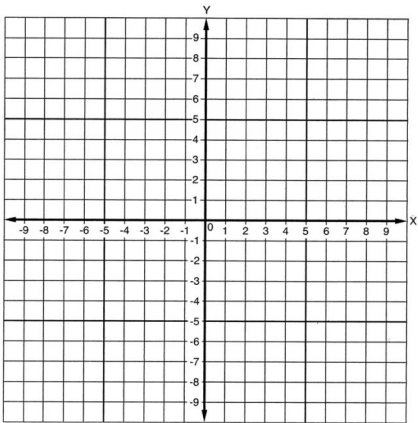
We can see from the graph that the function crosses the x-axis at $x = -1$ and $x = 3$, so the solutions to this equation are $x = -1$ or $x = 3$. Note: If the function does not cross the x axis, there are no solutions to the equation.

Solve the quadratic equations by making a graph.

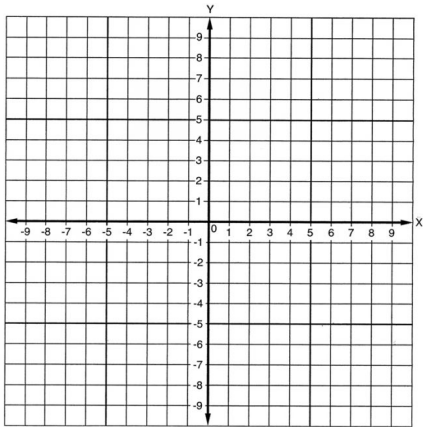
1. $3x^2 + 3x - 6 = 0$



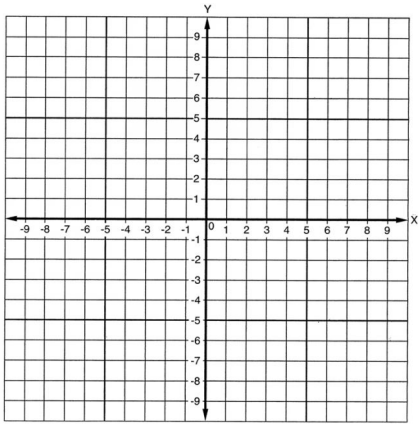
2. $-4x^2 + 28x - 48 = 0$



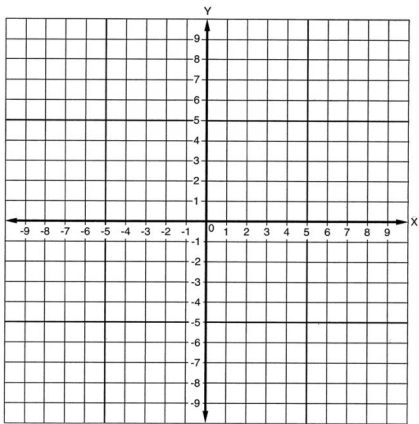
3. $-x^2 + x + 2 = 0$



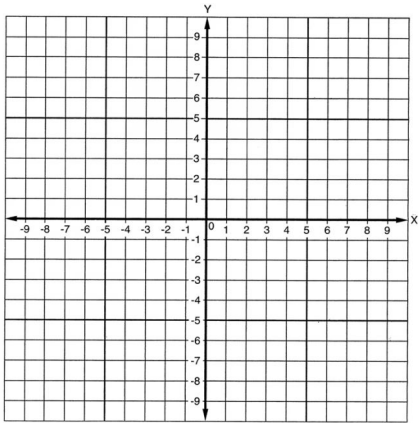
4. $3x^2 + 27x + 60 = 0$



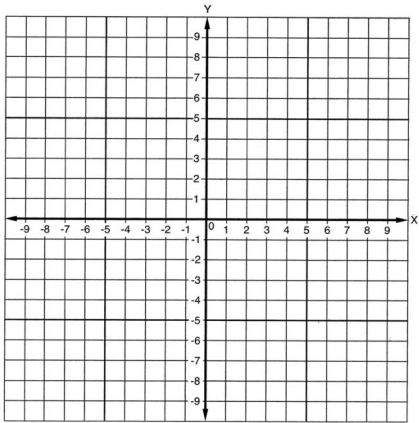
5. $-2x^2 + 12x - 16 = 0$



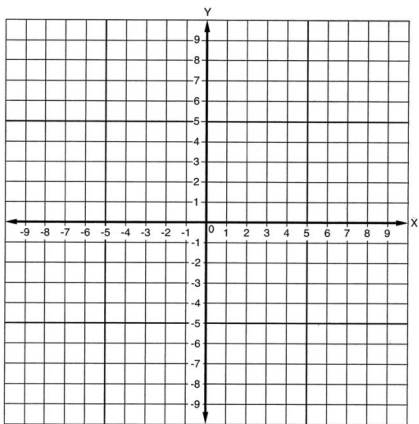
6. $x^2 + 3x + 2 = 0$



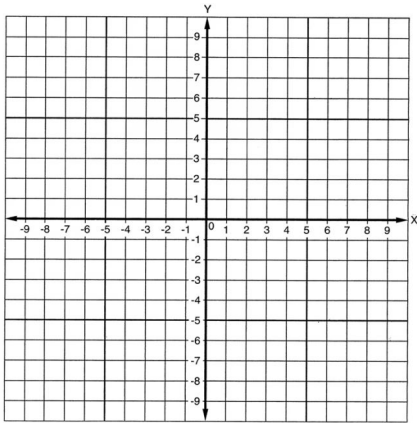
7. $5x^2 + 10x + 5 = 0$



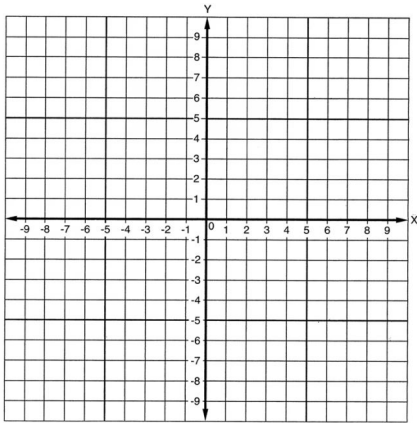
8. $-3x^2 + 6x - 3 = 0$



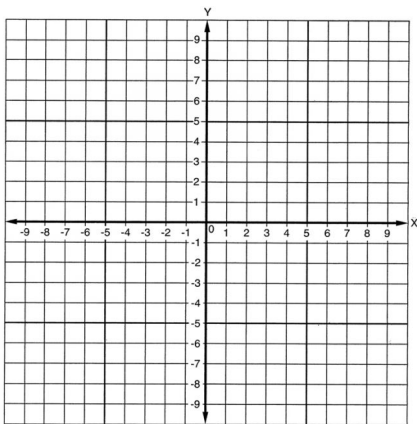
9. $-x^2 - 8x - 16 = 0$



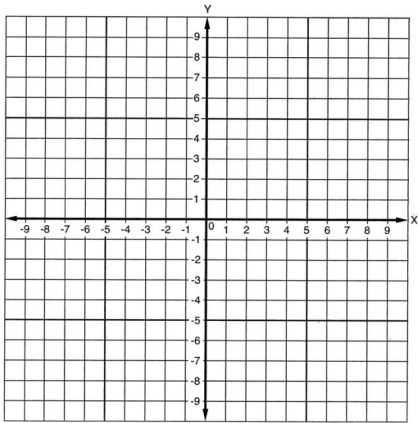
10. $4x^2 - 24x + 36 = 0$



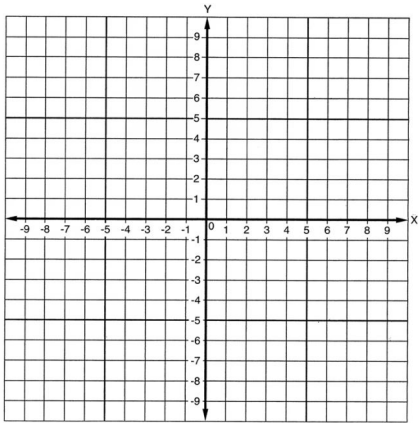
11. $-2x^2 - 15x - 30 = 0$



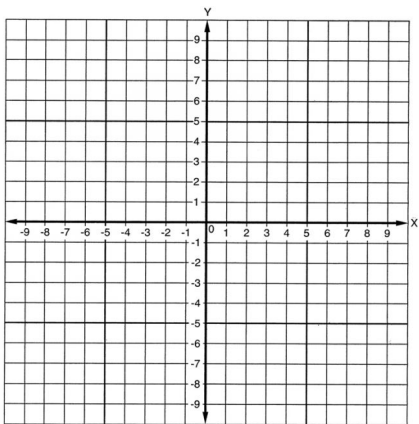
12. $-4x^2 + 5x - 4 = 0$



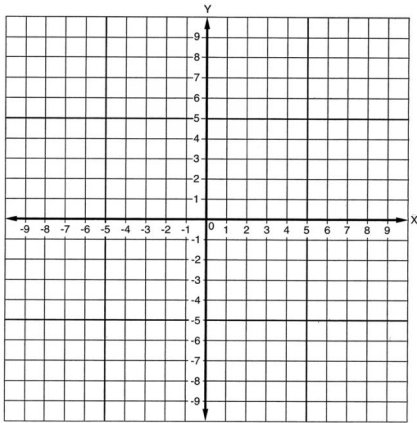
13. $-x^2 - 3x - 3 = 0$



14. $3x^2 + 7x + 5 = 0$



15. $-5x^2 + 19x - 20 = 0$



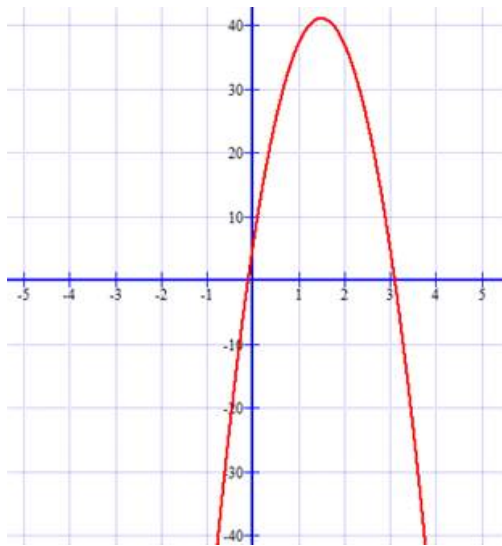
Example 2: A basketball player throws a basketball with an initial vertical velocity of 48 feet per second from a height of 5 feet. Use the vertical motion model, $h = -16t^2 + vt + s$ where v is the initial velocity in feet/second and s is the height in feet to calculate how long the basketball will be in the air for. Round your answer to the nearest tenth.

Solution:

In order to find the time, the basketball is in the air, we plug in the values we know and solve for t .

$$h = -16t^2 + vt + s$$

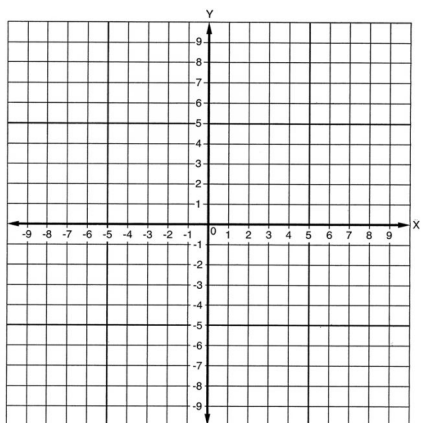
$$0 = -16t^2 + 48t + 5$$



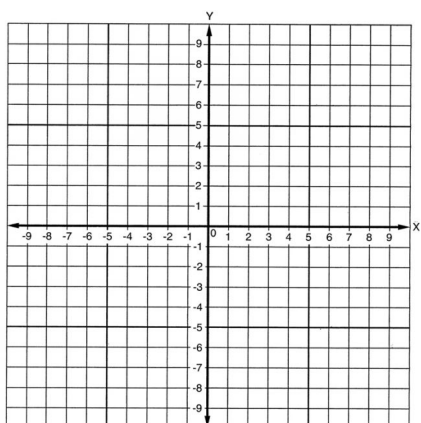
The function crosses the x-axis at $t = -0.1$ and $t = 3.1$, but since time can only be positive, we know that the basketball was in the air for **3.1 seconds**.

Solve the following similar problems:

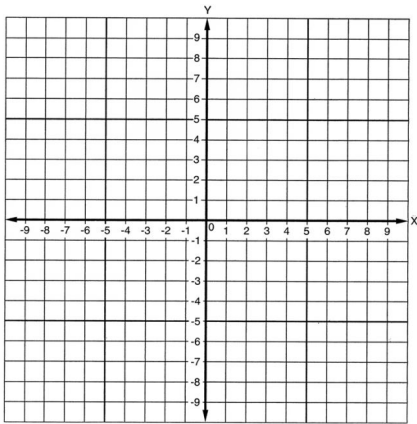
16. A policeman shoots a bullet with an initial vertical velocity of 128 feet per second from a building that is 68 feet away from the ground. Use the vertical motion model, $h = -16t^2 + vt + s$ where v is the initial velocity in feet/second and s is the height in feet to calculate how long the bullet will be in the air for. Round your answer to the nearest tenth.



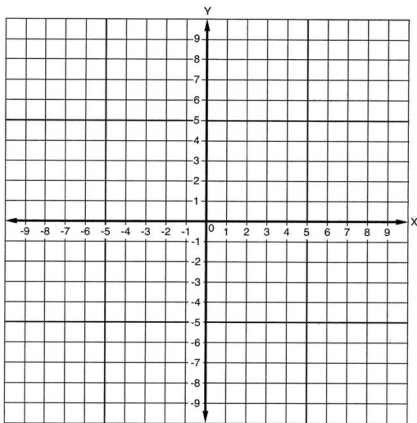
17. A dolphin breeder throws a fish with an initial vertical velocity of 32 feet per second from a height of 20 feet away from the dolphin. Use the vertical motion model, $h = -16t^2 + vt + s$ where v is the initial velocity in feet/second and s is the height in feet to calculate how long the fish will be in the air for. Round your answer to the nearest tenth.



18. A boy throws a book with an initial vertical velocity of 12.8 feet per second from a height of 3.2 feet. Use the vertical motion model, $h = -16t^2 + vt + s$ where v is the initial velocity in feet/second and s is the height in feet to calculate how long the book will be in the air for.



19. The equation $y = x^2 - 12x + 45$ models the number of books y sold in a bookstore x days after an award-winning author appeared at an autograph signing reception. What was the first day that at least 100 copies of the book were sold?



20. Use the graph below to determine the number of solutions to the following quadratic equation

$$y = 5x^2 - 20x + 20$$

