Write

Describe how a graph can be used to determine the solutions to a system of nonlinear equations in your own words.

Remember

A system of equations consisting of a linear and a quadratic equation can have no solution, one solution, or two solutions. A system of equations consisting of two quadratic equations can have no solution, one solution, two solutions, or an infinite number of solutions.

Practice

1. The Fandango Bike Company specializes in children's bikes. Each month, the company must keep track of their costs and revenue. Their costs consist of fixed costs that include rent, utilities, and workers' salaries, as well as the variable cost to make the bikes. The company's costs can be represented by the function $C(x) = 25x + 900$. The company's revenue for every bike sold can be represented by the function $R(x) = 100x - x^2$.
   a. Determine the break-even point(s) for the month.
   b. What is the solution to this system of equations? Explain what the solution means in terms of the problem.
   c. Verify the solution by graphing both the cost and the revenue equations and interpreting the points of intersection.

2. Due to the rising costs of running a business, the Fandango Bike Company anticipates fixed costs in the next year to be $1800 per month, whereas the cost to make each bike will stay at $25 per bike.
   a. Determine the number of bikes the company will now need to make for one month to break even if the revenue from selling bikes remains the same.
   b. Verify the solution by graphing both the revenue and the cost equations.
   c. What does the company need to do to be able to break even for the month?

3. The company decides to change its location to a new building that is more energy efficient in order to help decrease fixed costs. It also invests in new machinery to reduce the number of employee hours needed to make a bike. The new monthly cost equation is represented by $C = 0.4x^2 + 15x + 400$. The company then decides to sell the bikes strictly online. The new monthly revenue equation becomes $R = 100x + 0.6x^2$.
   a. Determine the break-even point(s) for the company for each month.
   b. Verify the solution by graphing both the revenue and the cost equations and interpreting the points of intersection.

Stretch

Graph the inequalities given and describe what the double shaded region means in your own words.

$$\begin{cases} y > 2x + 5 \\ y \leq -3x^2 + 15x \end{cases}$$

Review

1. Rewrite the radical $\sqrt{72}$ by extracting a perfect square.
2. Solve $x^2 - 12 = 5$.
3. Perform each operation.

    a. $(7x^3 + 5x^2 - 8x) + (3x^3 - 4x^2 + 11)$ b. $(6x - 2y) - (3x - 5y)$.

4. A soccer ball is kicked up off a 5-meter-high platform with an initial velocity of 27 meters per second.

    a. Write an inequality to represent when the soccer ball will be above 40 meters.

    b. Graph the inequality and state when the soccer ball will be above 40 meters.