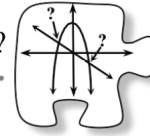**3.1.2** How can I use a graph to solve an equation?

Solving Equations Graphically

#24

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a. Use algebraic strategies to solve

$\sqrt{2x+3} = x.$

b. How many solutions does $y = \sqrt{2x+3}$ have? How many solutions does $y = x$ have?

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c . How will graphing help her determine the solution?

d. Graph the system on your graphing calculator and locate the intersection point(s) of the graphs. How many intersection points are there? Does this confirm your solution from part (a)?

#25 When a result from a correctly-solved equation does not make the original equation true, it is called an extraneous solution. It is not a solution of the equation, even though it is a result when solving algebraically. If you have not already done so, check your solutions from part (a) of problem 3-24 algebraically.

#26 But why does the extraneous solution appear in this problem? Examine the graph of the system of equations $y = \sqrt{2x+3}$ and $y = x$, shown at right. Where would an extraneous solution $x = -1$ appear on the graph? Why do the graphs not intersect at that point? Explain.

#27

a. Solve $2x^2 + 5x - 3 = x^2 + 4x + 3$ algebraically.

b. Where does Gustav get the equation $y = x^2 + x - 6$?	c. How many solutions will $y = x^2 + x - 6$ have?
d. How can you see the solutions to $2x^2 + 5x - 3 = x^2 + 4x + 3$ in the graph of $y = x^2 + x - 6$? Explain why this makes sense.	e. Maiya solves $2x^2 + 5x - 3 = x^2 + 4x + 3$ by graphing a system of equations and looking for the points of intersection. What equations do you think she uses? Explain where the solutions to the equation exist on the graph.

#28 Yajaira cannot figure out how to solve $20x + 1 = 3^x$ algebraically, so she decides to use her graphing calculator. However, when she graphs the equations $y = 20x + 1$ and $y = 3^x$, she gets the graph shown at right. After studying the graph, Yajaira thinks there are no solutions to $20x + 1 = 3^x$.
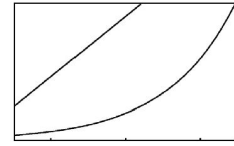
| a. What do you think? If there are solutions, what are they? If there are no solutions, demonstrate that there cannot be a solution.	b. What should solutions to the equation $20x + 1 = 3^x$ look like? In other words, will solutions be a single number, or will they be the coordinates of a point? Explain.
c. Yajaira's teammate, Emma, starts to solve by subtracting 1 from both sides of the equation. When she graphs her system later, she uses the equations $y = 20x$ and $y = 3^x - 1$. Will she get the same solutions?	d. Discuss with your team why Yajaira cannot solve the system algebraically. What do you think?

#29 Jack was working on solving an equation and he graphed the functions

$f(x) = \dfrac{12}{x}$

and

$g(x) = -(x - 3)^2 + 4,$

as shown at right.

$f(x) = \dfrac{12}{x}$

$g(x) = -(x - 3)^2 + 4$
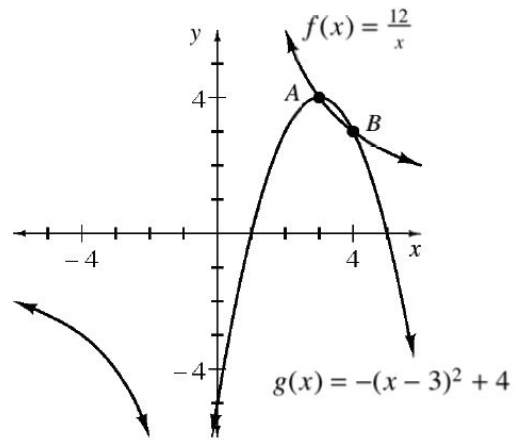
a. What equation was Jack solving?

b. Use points *A* and *B* to solve the equation you wrote in part (a).

c. Are there any other solutions to the equation you wrote in part (a)? If so, show that these other solutions make your equation true.