ADVANCED EQUATION CONCEPTS DRILL

Solve for x: $2x^2-5x+1=0$
For what value of x is the following function undefined?

$$y=\frac{14x-5}{2x+3}$$

If x is going to have only imaginary solutions, what are the possible values of c in this equation? (If needed, see "Imaginary Numbers" on page 361.)

$$x^2+2x+c=0$$

What is the solution (or solutions) to this equation?

$$x=\sqrt{12-x}$$

Solve for x by completing the square: $x^2-8x-20=0$.

Solutions

Use the quadratic equation to solve:

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
$$x=\frac{-(-5)\pm\sqrt{(-5)^2-4(2)(1)}}{2\ 2}$$
$$x=\frac{5\pm\sqrt{25-8}}{4}$$
$$x=\frac{5\pm\sqrt{17}}{4}$$

In order for the function $y=\frac{14x-5}{2x+3}$ to be undefined, the denominator, $2x + 3$, should equal zero. Set up an equation to solve:

$$2x+3=0\rightarrow 2x=-3\rightarrow x=-\frac{3}{2}$$

Consider the quadratic equation: $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$. If x is going to have only imaginary solutions, the *discriminant* (b^2-4ac) in the quadratic formula must be *negative*. Why? If the discriminant was negative, you would be taking the square root of a negative number, which will result in imaginary solutions. For the equation $x^2+2x+c=0$, the value of a is 1, the value of b is 2, and c is a variable. Set up an inequality to solve:

$$b^2-4ac<0$$
$$2^2-4\ 1\ c<0$$
$$4-4c<0$$
$$4<4c$$
$$1<c$$

As long as c is greater than 1, there will be an imaginary solution to the equation. Start by squaring both sides of the equation:

$$x = \sqrt{12 - x}$$
$$x^2 = 12 - x$$
$$x^2 + x - 12 = 0$$

Then factor the equation:

$$x^2 + x - 12 = 0$$
$$(x+4)(x-3) = 0$$

It looks like -4 and 3 will work as solutions. However, you need to check for extraneous solutions by plugging these possible solutions back into the original equation.

Plug in 3 for *x:*

$$x = \sqrt{12 - x}$$
$$3 = \sqrt{12 - 3}$$
$$3 = \sqrt{9}$$
$$3 = 3$$

So 3 works.

Now plug in -4 for *x*:

$$-4 = \sqrt{12 - (-4)}$$
$$-4 = \sqrt{12 - (-4)}$$
$$-4 = \sqrt{16}$$
$$-4 \neq 4$$

So -4 is extraneous, and the only solution is 3.

Start by adding 20 to each side of the equation:

$$x^2 - 8x - 20 = 0$$
$$x^2 - 8x = 20$$

Now take half of -8, which is −4, square it, and add it to both sides:

$$x^2 - 8x + 16 = 20 + 16$$
$$x^2 - 8x + 16 = 36$$
$$(x-4)^2 = 6^2$$
$$\sqrt{(x-4)^2} = \sqrt{6^2}$$
$$x - 4 = \pm 6$$

The two solutions for *x* can be found as follows:

$$\begin{aligned} x-4&=6 \\ x&=10 \end{aligned} \quad \text{and} \quad \begin{aligned} x-4&=-6 \\ x&=-2 \end{aligned}$$

So *x* can be either 10 or −2.

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