Solve the equation.

1. $-3(x-1)=4(x+1)$ 2. $2(x-1)=x^2-x$

3. $4\left(x+\dfrac{3}{2}\right)=(x-2)3$ 4. $-2(x+1)=(x-8)(x-1)$

5. $3x(2x)=8(x+1)$ 6. $x(x-3)+4x(x-4)=3x(x-4)$

Warm Up

Use proper order of operations to solve!

Perform the indicated operation. Write your answer in standard form.

1. $(3+2i)-(5+i)$ 2. $-2i(11+7i)$

3. $(-5+3i)^2$ 4. $(-4+9i)(5+6i)$

5. $3i^5(4i^2-5i+8)$ 6. $(5-3i^7)-(11+2i^6)$

Cumulative Warm Up

review of imaginary unit

* remember when the base is the same and you are multiplying, add the exponents.

Essential Question

How can you solve a rational equation?

Essential Question

what you will learn:

· Solve rational equations by cross multiplying

· Solving rational equations by using common denominators

· Use Inverse functions

Work with a partner. Match each equation with the graph of its related system of equations. Explain your reasoning. Then use the graph to solve the equation.

a. $\dfrac{2}{x-1} = 1$ b. $\dfrac{2}{x-2} = 2$ c. $\dfrac{-x-1}{x-3} = x+1$
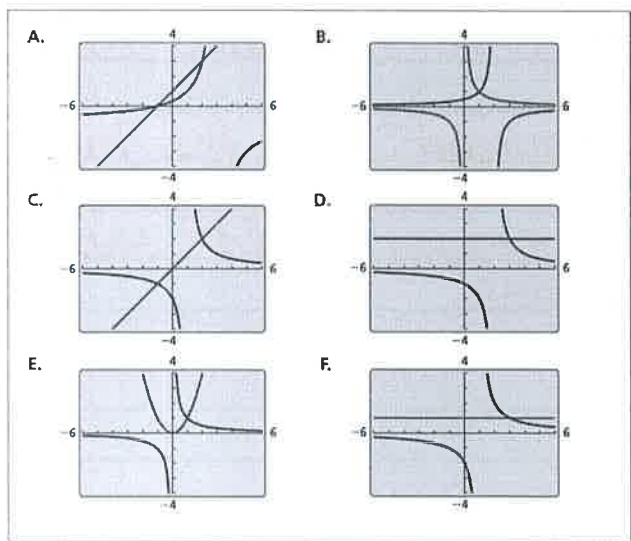
d. $\dfrac{2}{x-1} = x$ e. $\dfrac{1}{x} = \dfrac{-1}{x-2}$ f. $\dfrac{1}{x} = x^2$

Exploration 1a-f

*use graphing software to match

Skip

A.   B.   C.   D.   E.   F.

Exploration1 graphs

Skip

Work with a partner. Look back at the equations in Explorations 1(d) and 1(e). Suppose you want a more accurate way to solve the equations than using a graphical approach.

a. Show how you could use a *numerical approach* by creating a table. For instance, you might use a spreadsheet to solve the equations.

b. Show how you could use an *analytical approach*. For instance, you might use the method you used to solve proportions.

Exploration 2

Skip

Solve $\dfrac{3}{x+1} = \dfrac{9}{4x+5}$.

$$9(x+1) = 3(4x+5)$$
$$9x+9 = 12x+15$$
$$\underline{-9x-15} \quad \underline{-9x-15}$$
$$\dfrac{-6}{3} = \dfrac{3x}{3}$$
$$-2 = x$$

Example 1

use Crossmultiplication to solve

you should always check the solution in the original problem.

An *alloy* is formed by mixing two or more metals. Sterling silver is an alloy composed of 92.5% silver and 7.5% copper by weight. You have 15 ounces of 800 grade silver, which is 80% silver and 20% copper by weight. How much pure silver should you mix with the 800 grade silver to make sterling silver?

$$\dfrac{\text{percent}}{\text{of copper}} = \dfrac{\text{weight of copper}}{\text{total weight}}$$

$$\dfrac{7.5}{100} = \dfrac{(0.2)(15)}{15+x}$$

Example 2

use cross multiplication to solve.

Solve the equation by cross multiplying. Check your solution(s).

1. $\dfrac{3}{5x} = \dfrac{2}{x-7}$ 2. $\dfrac{-4}{x+3} = \dfrac{5}{x-3}$ 3. $\dfrac{1}{2x+5} = \dfrac{x}{11x+8}$

Monitoring Progress 1-3

Student practice

Solve each equation.

a. $4x\left(\dfrac{5}{x}+\dfrac{7}{4}=-\dfrac{9}{x}\right)$ $x(x\cdot5)$

b. $x(x-5)\left(-\dfrac{8}{x-5}=\dfrac{3}{x}\right)$

$4(5)+7(x)=-9(4)$
$20+7x=-36$
$-20-20$
$7x=-56$
$x=-8$

$x(x-5)-8x=3x-15$
$x^2-5x-8x=3x-15$
$x^2-13x=3x-15$
$-3x+15\,-3x\,+15$
$x^2-16x+15=0$

Example 3 $(x-15)(x-1)=0$
$\quad x=15 \quad x=1$

- Clear fraction
  - multiply by denominator(s) to clear

- make sure to multiply every term, both sides of the equal sign.

Student practice

Solve the equation by using the LCD. Check your solution(s).

4. $\dfrac{15}{x}+\dfrac{4}{5}=\dfrac{7}{x}$ 5. $\dfrac{3x}{x+1}-\dfrac{5}{2x}=\dfrac{3}{2x}$ 6. $\dfrac{4x+1}{x+1}=\dfrac{12}{x^2-1}+3$

Monitoring Progress 4-6

Solve $\left(\dfrac{6}{x-3}=\dfrac{8x^2}{x^2-9}-\dfrac{4x}{x+3}\right)(x-3)(x+3)$
$(x-3)$
$(x+3)$

$(x-3)(x+3)\left(\dfrac{6}{x-3}\right)=(x-3)(x+3)\left(\dfrac{8x^2}{x^2-9}\right)-(x-3)(x+3)\left(\dfrac{4x}{x+3}\right)$

$6(x+3)=8x^2-(4x(x-3))$
$6x+18=8x^2\overset{\pm}{}(4x^2\overset{\pm}{}12x)$
$6x+18=4x^2+12x$
$-6x-18-6x\,-18$
$0=4x^2+6x-18$
Example 4
$0=2(2x^2+3x-9)$

use the same process

$0=2(2x^2+3x-9)$
$0=2(2x-3)(x+3)$

$2x-3=0 \qquad\qquad x+3=0$
$2x=3 \qquad\qquad\quad x=-3$
$x=\dfrac{3}{2}$

* double check answers
-3 won't work!

Solve the equation. Check your solution(s).

7. $\dfrac{9}{x-2} + \dfrac{6x}{x+2} = \dfrac{9x^2}{x^2-4}$ 8. $\dfrac{7}{x-1} - 5 = \dfrac{6}{x^2-1}$

Monitoring Progress 7-8

Student practice

Consider the function $f(x) = \dfrac{2}{x+3}$.

Determine whether the inverse of f is a function.

Then find the inverse.

Example 5

Skip

In Section 7.2 Example 5, you wrote the function $c = \dfrac{50m+1000}{m}$, which represents the average cost c (in dollars) of making m models using a 3-D printer.

Find how many models must be printed for the average cost per model to fall to $90 by (a) solving an equation, and (b) using the inverse of the function.

Example 6

Skip

9. Consider the function $f(x) = \frac{1}{x} - 2$.

Determine whether the inverse of f is a function. Then find the inverse.

10. **WHAT IF?** How do the answers in Example 6 change when $c = \frac{50m + 800}{m}$?

Monitoring Progress 9-10

Skip

• **Muddiest Point:** Ask students to identify, aloud or on a paper to be collected, the muddiest point(s) about the lesson. What was difficult to understand?

Closure