

**Topic:** Finding Inverses Algebraically

**Name:** \_\_\_\_\_

**What am I learning today?**

**Warm Up**

$\sqrt{\quad}$   $\leftarrow$   $x$   $\rightarrow$   $\square$   
 $+$   $\leftarrow$   $\rightarrow$   $1$   
 $x$   $\leftarrow$   $\rightarrow$   $1$   
 $\sqrt{\quad}$   $\leftarrow$   $(\quad)$   
 $\sqrt{\quad}$   $\leftarrow$   $(\quad)$

Solve the following for  $x$

1)  $\sqrt{x+4} = 5$   
 $x+4 = 25$   
 $x = 21$

2)  $2x^3 - 3 = 13$

$2x^3 = 16$   
 $\sqrt[3]{x^3} = \sqrt[3]{8}$   
 $x = 2$

Solve the following for  $y$ .

3)  $y = 6x + 5$   
 $y = \frac{6x+5}{3}$   
 $y = 2x + \frac{5}{3}$

4)  $4x = y^2 + 6$

$\sqrt{4x-6} = y^2$   
 $y = \pm \sqrt{4x-6}$

$x^2 = 81$   
 $x = \pm 9$

**Notes**

Finding Inverses Algebraically

Wed. - Aruna - TRF

A **function** is a term used to describe the relationship between an  $x$  and  $y$  variable.

The independent variable is on the  $x$  axis.

The dependent variable is on the  $y$  axis.

An **inverse function** is a function that "negates" another function. We think of a function and its **inverse** as **opposites** of one another.

Steps for finding an inverse algebraically

- 1) Change  $f(x)$  to  $y$ .
- 2) Switch  $x$  and  $y$ .
- 3) Solve for  $y$ . (get  $y$  by itself)
- 4) Change  $y$  to  $f^{-1}(x)$ .

**Examples**

Find the inverse of each function.

Ex 1:  $f(x) = 2x - 6$

STEP 1:  $y = 2x - 6$   
 STEP 2:  $x = 2y - 6$   
 STEP 3:  $x + 6 = 2y$   
 $\frac{x+6}{2} = \frac{2y}{2}$   
 $y = \frac{x+6}{2}$   
 STEP 4:  $f^{-1}(x) = \frac{x+6}{2}$

**SOLVING CHART**

OPERATIONS	OPPOSITE
$x \cdot 2$	$\div 2$
$-6$	$+6$

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**Examples**  
CONT

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

$$f^{-1}(x) = \frac{3x+5}{2}$$

Ex 2:  $f(x) = \frac{2x-5}{3}$

STEP 1:  $y = \frac{2x-5}{3}$

STEP 2:

STEP 3:  $3x = \frac{2y-5}{3} \cdot 3$

$$3x = 2y - 5$$

$$3x + 5 = 2y$$

STEP 4:

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

**SOLVING CHART**

OPERATIONS	OPPOSITE
$\times 2$	$\div 2$
$- 5$	$+ 5$
$\div 3$	$\times 3$

Ex 3:  $f(x) = \frac{1}{3}x^2 + 7$

$$y = \frac{1}{3}x^2 + 7$$

$$x = \sqrt{\frac{3}{1}(y-7)}$$

$$f^{-1}(x) = \pm \sqrt{3x-21}$$

Ex 4:  $f(x) = (x-1)^2$

$$y = (x-1)^2$$

$$\sqrt{x} = y-1$$

$$\sqrt{x} + 1 = y$$

$$f^{-1}(x) = \sqrt{x} + 1$$

Ex 5:  $f(x) = \sqrt[3]{x} - 6$

$$y = \sqrt[3]{x} - 6$$

$$y + 6 = \sqrt[3]{x}$$

$$(y+6)^3 = x$$

$$f^{-1}(x) = (x+6)^3$$

**You Try:**

1)  $f(x) = \frac{\sqrt[3]{x+2}-1}{4}$

$$y = \frac{\sqrt[3]{x+2}-1}{4}$$

$$4 \cdot x = \sqrt[3]{y+2}-1$$

$$4x + 1 = \sqrt[3]{y+2}$$

$$(4x+1)^3 = y+2$$

**SOLVING CHART**

OPERATIONS	OPPOSITE
$(4x+1)^3 = y+2$	$\div 2$
$(4x+1)^3 - 2 = y$	
$f^{-1}(x) = (4x+1)^3 - 2$	

**Summary**

Summarize the lesson in your own words