5.6 Inverses of Linear Functions Part 2

Finding the inverse of an equation

How?

Step 1	Replace $f(x)$ with y in the equation for $f(x)$.
Step 2	Interchange y and x in the equation.
Step 3	Solve the equation for y.
Step 4	Replace y with $f^{-1}(x)$ in the new equation.

1.Find the inverse of f(x) = 5x + 10

$y = 5x + 10$

$\downarrow$

$x = 5y + 10$

$-10 \quad -10$

$\frac{x-10}{5} = \frac{5y}{5}$

$\frac{1}{5}x - 2 = y \Rightarrow$ Inverse y $\downarrow$ $f^{-1}(x) = \frac{1}{5}x - 2$

2. Find the inverse of f(x) = $\frac{1}{4}$x - 1

$y = \frac{1}{4}x - 1$

$x = \frac{1}{4}y - 1$

$+1 \quad +1$

$4(x+1 = \frac{1}{4}y)$

$4x + 4 = y \Rightarrow f^{-1}(x) = 4x + 4$

3. Find the inverse of $f(x) = -\frac{2}{3}x - 8$

$y = -\frac{2}{3}x - 8$

$x = -\frac{2}{3}y - 8$

$+8 \quad +8$

$-3\left(x + 8 = -\frac{2}{3}y\right)$

$-\frac{3x}{2} - \frac{24}{2} = \frac{2y}{2}$

$\frac{-3}{2}x - 12 = y$

$f^{-1}(x) = -\frac{3}{2}x - 12$

4. Find the inverse of f(x) = -2x + 18

5. Skylar and Carmen rent a paddle boat at a state park for $15 plus $4 for each hour it is used. The function C(x) = 4x + 15 represents the total cost for C(x) for x hours.

a. Determine the inverse function.

$C(x)$ = Total $

x = hours

$35 = 4x + 15$

$y = 4x + 15$

$x = 4y + 15$

$-15 \quad -15$

$\frac{x - 15}{4} = \frac{4y}{4}$

$C^{-1}(x) = \frac{1}{4}x - \frac{15}{4}$

b. Interpret $C^{-1}(x)$ and x in the context of the inverse function.

$C^{-1}(x)$: Hours

x : Total $

c. Skylar and Carmen have $35 to rent the paddle boat. How long can they rent it?

$C^{-1}(x) = \frac{1}{4}x - \frac{15}{4}$

$\frac{1}{4}(35) - \frac{15}{4}$

$= 5$

6. The student population has been growing at Knox High School by an average of 18 students each year since 2010.

The function P(x) = 18x +954 represents the total student population P(x), where x is the number of years since 2010.

a. Find the inverse function.

$P^{-1}(x) = \frac{1}{18}x - 53$

$y = 18x + 954$

$x = 18y + 954$

$-954 \quad -954$

$\frac{x - 954}{18} = \frac{18y}{18}$

b. Interpret the meaning of x and $P^{-1}(x)$ in the context of the inverse function.

$P^{-1}(x)$: years

x : Total population

c. In which year did the population reach 1080?