Finding the Solution of $x$ when given two functions

A \textit{function} is a correspondence between two sets (called the \textit{domain} and the \textit{range}) such that to each element of the domain, there is assigned exactly one element of the range.

When an equation represents a function, the variable (usually $x$) whose values make up the \textit{domain} is called the \textit{independent variable}.

The other variable (usually $y$) whose values make up the \textit{range} is called the \textit{dependent variable} because its values depend on $x$.

Equations that represent functions are often written in \textit{function notation}.

The equation $y = 2x + 1$ can be written as $f(x) = 2x + 1$.

The symbol $f(x)$ replaces the $y$ and is read $f$ of $x$.

The $f$ is just the \textit{name} of the function.

It is NOT a variable that is multiplied by $x$.

Function Notation: $f(x)$ means $f$ of $x$

Function Notation: $g(x)$ means $g$ of $x$

I refer to this as fred meets ginger to help you remember to set these functions equal to one another and then solve.

You will solve these by using \textbf{INVERSE} operations!

What is the solution to $f(x) = g(x)$?

\begin{align*}
\text{Ex 1:} & \quad f(x) = 10x + 2 \quad \text{this is} \quad \text{fred} \\
& \quad g(x) = 5x + 17 \quad \text{this is} \quad \text{ginger}
\end{align*}

First: Set up the problems by setting the functions equal to one another!

\begin{align*}
\text{Ex 1:} & \quad 10x + 2 = 5x + 17 \quad \text{fred meets} \quad \text{ginger} \\
& \quad 10x + 2 = 5x + 17 \quad \text{start by moving variable to left side with inverse operation} \\
& \quad -5x \quad -5x \\
& \quad 5x \quad 5x \\
& \quad f(x) = g(x)
\end{align*}
\[
5x + 2 = 17 \\
-2 -2 \\
\underline{5x = 15} \\
5 5 \\
x = 3
\]

What is the solution to \( f(x) = g(x) \)?

Ex 2: 
\[
f(x) = 2.4 + 0.4x \quad \text{this is} \quad \text{fred} \\
g(x) = 0.28x - 1.2 \quad \text{this is} \quad \text{ginger}
\]

First: Set up the problems by setting the functions equal to one another!

Ex 2: 
\[
2.4 + 0.4x = 0.28x - 1.2
\]

\[
2.4 + 0.4x = 0.28x - 1.2 \quad \text{start by moving variable to left side with inverse operation} \\
-0.28x -0.28x \\
\underline{2.4 + 0.12x = -1.2} \\
-2.4 -2.4 \\
\underline{0.12x = -3.6} \\
0.12 0.12 \\
x = -30
\]

What is the solution to \( f(x) = g(x) \)?

Ex 3: 
\[
f(x) = x + 7 \quad \text{this is} \quad \text{fred} \\
g(x) = x - 3 \quad \text{this is} \quad \text{ginger}
\]

First: Set up the problems by setting the functions equal to one another!

Ex 3: 
\[
x + 7 = x - 3
\]

\[
x + 7 = x - 3 \quad \text{start by moving variable to left side with inverse operation} \\
-1x -1x \\
\underline{7 \neq -3} \\
\underline{\text{NO SOLUTION}} \\
\text{There is no number that can be substituted for} \ x \ \text{to make the equation true!} \\
f(x) = g(x) \text{ Notes, Page 2}
What is the solution to \( f(x) = g(x) \)?

**Ex 4:**

\[
\begin{align*}
\text{f}(x) &= 4x + 5 \quad \text{this is} \quad \text{fred} \\
\text{g}(x) &= 4x - 5 \quad \text{this is} \quad \text{ginger}
\end{align*}
\]

**First:** Set up the problems by setting the functions equal to one another!

**Ex 4:**

\[
4x + 5 = 4x - 5
\]

\[
\begin{align*}
4x + 5 &= 4x - 5 \\
-4x &\quad -4x \\
5 &= 5 \\
\end{align*}
\]

**IDENTITY**

No matter what number you substitute in for \( x \), it makes the equation true! All real numbers work!

---

**Real World Application Problem:**

Daisy’s Flowers sells a rose bouquet for \$26 plus \$4.50 for every rose. A competing florist sells a similar bouquet for \$39.95 plus \$2.95 for every rose. Find the number of roses that would make both florists’ bouquets cost the same price.

**What do we want to find?!**

We want to find the number of roses that would make both florist’s bouquets cost the SAME PRICE.

**What function represents Daisy’s Flowers rose bouquet?**

bouquet costs \$26 plus \$4.50 for every rose

\[
f(x) = 26 + 4.5x
\]

**What function represents the competing florist’s rose bouquet?**

bouquet costs \$39.95 plus \$2.95 for every rose

\[
g(x) = 39.95 + 2.95x
\]

**How do we solve the problem now?!**

\[
f(x) = g(x)
\]

\[
26 + 4.5x = 39.95 + 2.95x
\]

Find the \# of roses that would make both florist’s bouquets cost the same price

\[
f(x) = g(x)
\]