

Precalculus A

Chapter 1

1.5 Relations and Inverses

Hw: Section 1.5 HW Worksheet

B. Paulson

Find the formulas for the functions $f + g$, $f - g$ and $f \cdot g$. Give the domain of each.

1. $f(x) = 2x - 1$; $g(x) = x^2$

- $\bullet 2x - 1 + x^2$
- $\bullet 2x - 1 - x^2$
- $\bullet (2x - 1)(x^2) \rightarrow 2x^3 - x^2$

\mathbb{R}

3. $f(x) = \sqrt{x}$; $g(x) = \sin x$

- $\bullet \sqrt{x} + \sin x$
- $\bullet \sqrt{x} - \sin x$
- $\bullet \sqrt{x}(\sin x)$

$[0, \infty)$

Find the formulas for f/g and g/f . Give the domain of each.

5. $f(x) = \sqrt{x+3}$; $g(x) = x^2$

- $\bullet \frac{\sqrt{x+3}}{x^2}$
- $\bullet \frac{x^2}{\sqrt{x+3}}$

$x \neq 0$
 $(-3, \infty)$

$[-3, 0) \cup (0, \infty)$
7. $f(x) = x^2$; $g(x) = \sqrt{1-x^2}$

- $\bullet \frac{x^2}{\sqrt{1-x^2}}$
- $\bullet \frac{\sqrt{1-x^2}}{x^2}$

$(-1, 1)$ $[-1, 0) \cup (0, 1]$

Find $(f \circ g)(3)$ and $(g \circ f)(-2)$.

2. $f(x) = (x-1)^2$; $g(x) = 3-x$

- $\bullet (x-1)^2 + 3 - x \rightarrow x^2 - 3x + 4$
- $\bullet (x-1)^2 - (3-x) \rightarrow x^2 - x - 2$
- $\bullet (x-1)^2(3-x) \rightarrow -x^3 + 5x^2 - 7x + 3$

\mathbb{R}

4. $f(x) = \sqrt{x+5}$; $g(x) = |x+3|$

- $\bullet \sqrt{x+5} + |x+3|$
- $\bullet \sqrt{x+5} - |x+3|$
- $\bullet \sqrt{x+5}(|x+3|)$

$[-5, \infty)$

6. $f(x) = \sqrt{x-2}$; $g(x) = \sqrt{x+4}$

- $\bullet \frac{\sqrt{x-2}}{\sqrt{x+4}}$
- $\bullet \frac{\sqrt{x+4}}{\sqrt{x-2}}$

$x \geq -4$
 $[2, \infty)$ $(2, \infty)$

8. $f(x) = x^3$; $g(x) = \sqrt[3]{1-x^3}$

- $\bullet \frac{x^3}{\sqrt[3]{1-x^3}}$
- $\bullet \frac{\sqrt[3]{1-x^3}}{x^3}$

$(-\infty, 1) \cup (1, \infty)$ $(-\infty, 0) \cup (0, \infty)$

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Find $f(g(x))$ and $g(f(x))$. State the domain of each.

11. $f(x) = 3x + 2$; $g(x) = x - 1$

• $3(x-1) + 2 = 3x - 3 + 2 = 3x - 1$ \mathbb{R}

• $3x + 2 - 1 = 3x + 1$ \mathbb{R}

13. $f(x) = x^2$; $g(x) = \sqrt{1-x^2}$

• $(\sqrt{1-x^2})^2 = 1 - x^2$ $[-1, 1]$

• $\sqrt{1-(x^2)^2} = \sqrt{1-x^4}$ $[-1, 1]$

12. $f(x) = x^2 - 2$; $g(x) = \sqrt{x+1}$

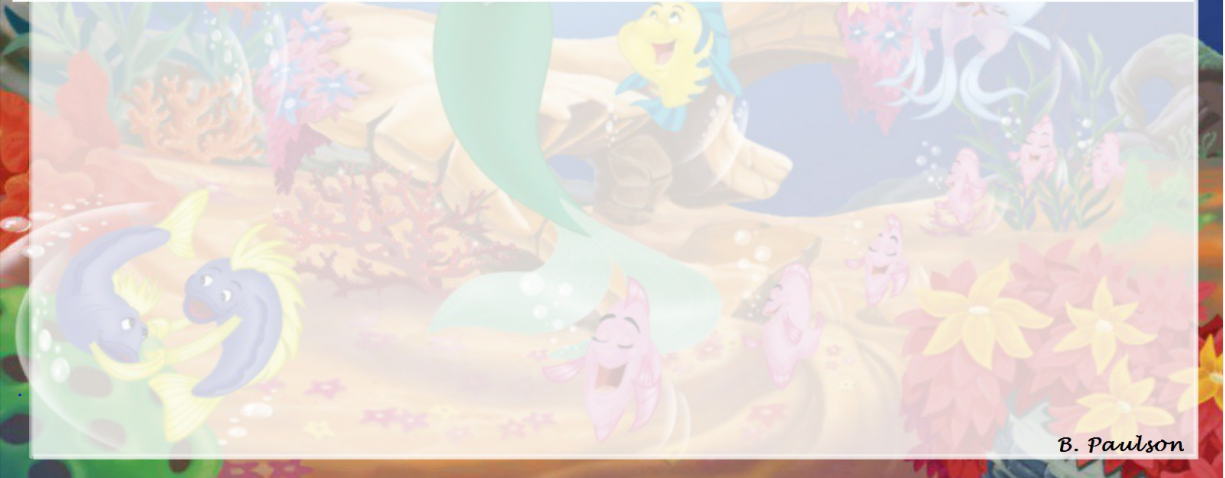
• $(\sqrt{x+1})^2 - 2 = x + 1 - 2 = x - 1$ $[-1, \infty)$

• $\sqrt{x^2 - 2 + 1} = \sqrt{x^2 - 1}$ $(-\infty, -1] \cup [1, \infty)$

14. $f(x) = \frac{1}{2x}$; $g(x) = \frac{1}{3x}$

• $\frac{1}{2(\frac{1}{3x})} = \frac{3x}{2}$ • $\frac{1}{3(\frac{1}{2x})} = \frac{2x}{3}$

$(-\infty, 0) \cup (0, \infty)$

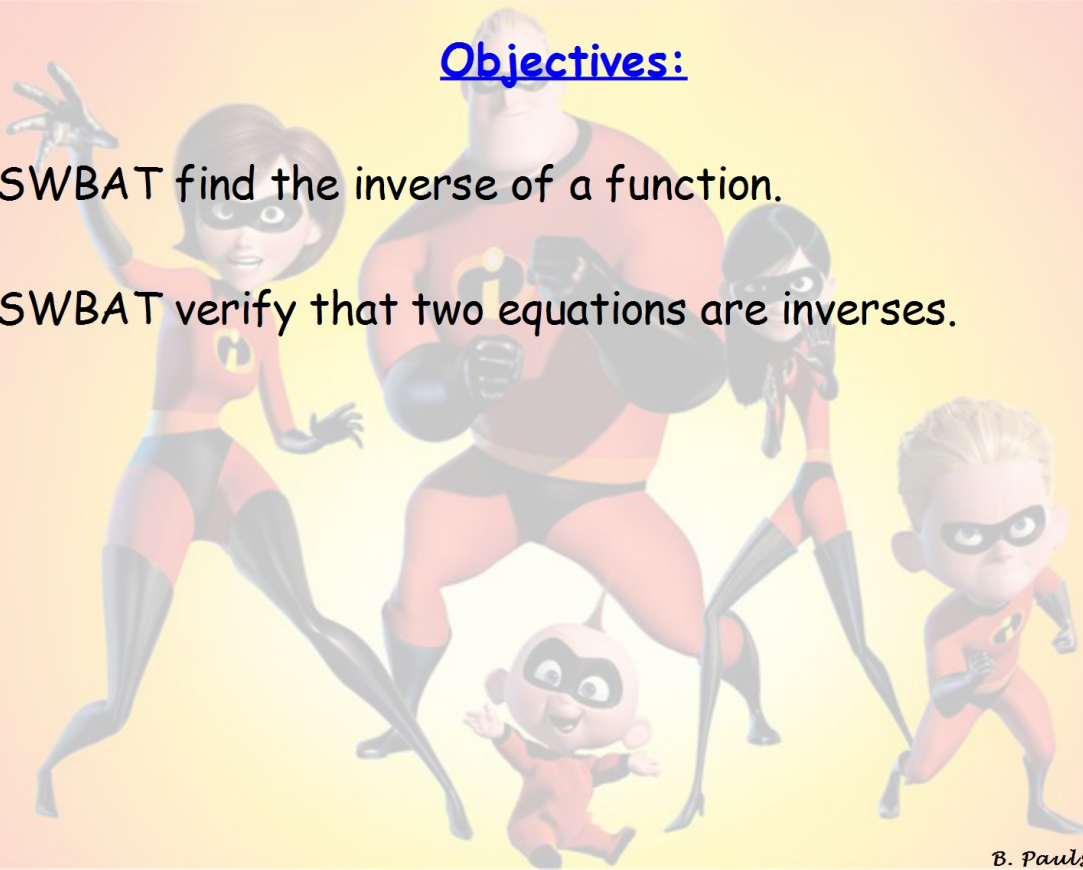


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Objectives:

SWBAT find the inverse of a function.

SWBAT verify that two equations are inverses.



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Inverse Functions

Vertical Line Test:

- If a function passes the VLT, then it is a function.

Horizontal Line Test:

- If a function passes the HLT, then its inverse is a function.

One-to-One Functions

- Functions that pass the vertical and horizontal line tests.

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How to Find an Inverse

Switch the x and the y. Then solve for y =.

Examples: $x=3$
 $y=19$

1. $y = 3x + 10$

$$\begin{array}{r} x = 3y + 10 \\ -10 \quad -10 \\ \hline \end{array}$$

$$\frac{x-10}{3} = \frac{3y}{3}$$

$$y = \frac{x-10}{3}$$

2. $y = 3x^2 - 3$

$$\begin{array}{r} x = 3y^2 - 3 \\ +3 \quad +3 \\ \hline \end{array}$$

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

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

$$y = \pm \sqrt{\frac{x+3}{3}}$$

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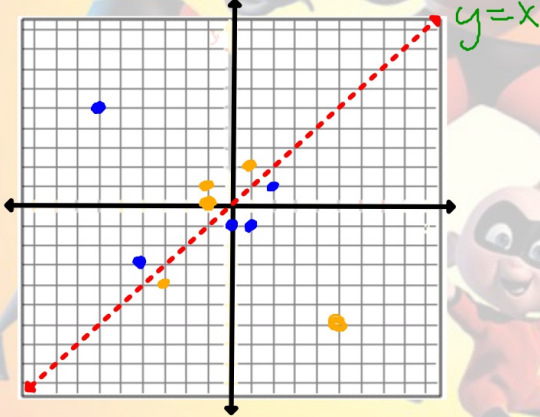
Graphing Inverses

The graphs of the inverses should appear to be reflections over the line $y = x$ (the reason the composition of both equaled x).

- Switch the x, y values of coordinates to get coordinates of the inverse.

$$(-1, 0) (-1, 1) (1, 2) (-3, -4) (5, -6) \quad y = x$$

1. $\{(0, -1), (1, -1), (2, 1), (-4, -3), (-6, 5)\}$



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