

Review Worksheet – Algebra of Functions, Inverses of Functions

1. $f(x) = x - 2$ and $g(x) = x^2 + 5x - 14$

- Find $f + g$ and its domain.
- Find $f - g$ and its domain.
- Find $f \cdot g$ and its domain.
- Find $\frac{f}{g}$ and its domain.

3. $f(x) = \frac{3}{x}$ and $g(x) = \frac{x-1}{x+6}$

- Find $(f \circ g)(x)$ and its domain.
- Find $(f \circ g)(3)$.
- Find $(g \circ f)(x)$ and its domain.
- Find $(g \circ f)(-1)$.

5. $h(x) = f(g(x))$

Find the functions $f(x)$ and $g(x)$

- $h(x) = \sqrt[3]{x+6}$
- $h(x) = |x^2 - 2|$
- $h(x) = \frac{1}{x^4 + 8x}$

2. $f(x) = \frac{x+1}{x^2-49}$ and $g(x) = \frac{2x-3}{x^2-49}$

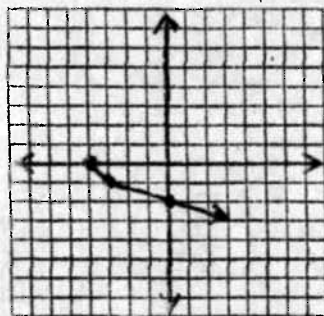
- Find $f + g$ and its domain.
- Find $f - g$ and its domain.
- Find $f \cdot g$ and its domain.
- Find $\frac{f}{g}$ and its domain.

4. $f(x) = \sqrt{x-3}$ and $g(x) = 2 - x^2$

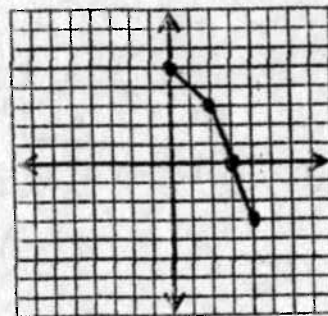
- Find $f \circ g$.
- Find $g \circ f$ and its domain.

6. Given the graph of f , sketch the graph of f^{-1} on the same axes.

a.



b.



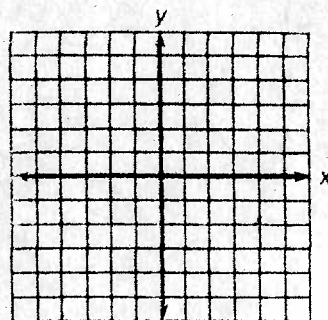
7. Find f^{-1} for each function below:

State the domain and range of $f(x)$ and $f^{-1}(x)$.

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

8. $f(x) = (x+1)^2$ for $x \geq -1$

- Find $f^{-1}(x)$.
- Sketch $f(x)$ and $f^{-1}(x)$ on the same set of axes.
- State the domain and range of $f(x)$ and $f^{-1}(x)$.



Key: Review Algebra + Inverse of Functions

1) a) $f+g = x^2 + 6x - 16$
D: \mathbb{R}

b) $f-g = -x^2 - 4x + 12$
D: \mathbb{R}

c) $f \cdot g = x^3 + 3x^2 - 24x + 28$
D: \mathbb{R}

d) $\frac{f}{g} = \frac{x-2}{x^2+5x-14} = \frac{(x-2)}{(x+7)(x-2)}$
 $\frac{1}{x+7}$ D: $x \neq -7, 2$

3) a) $f \circ g = f\left(\frac{x-1}{x+6}\right) = \frac{3x+18}{x-1}$ D: $x \neq -6, 1$

b) $(f \circ g)(3) = f(g(3))$
 $f\left(\frac{3-1}{3+6}\right) = f\left(\frac{2}{9}\right) = \frac{3}{9} = \frac{1}{3}$
 $\frac{27}{2}$

c) $g \circ f = g\left(\frac{3}{x}\right) = \frac{\frac{3}{x}-1}{\frac{3}{x}+6}$ (x)
 $\frac{3-x}{3+6x}$ D: $x \neq 0, -\frac{1}{2}$

d) $(g \circ f)(-1) = g(f(-1))$
 $= g\left(\frac{3}{-1}\right) = \frac{-3-1}{-3+6} = \frac{-4}{3}$

5) $h(x) = \sqrt[3]{x+6}$ $h(x) = f(g(x))$

a) $g(x) = x+6$
 $f(x) = \sqrt[3]{x}$

b) $h(x) = |x^2-2|$
 $g(x) = x^2-2$
 $f(x) = |x|$

c) $h(x) = \frac{1}{x^4+8x}$
 $g(x) = x^4+8x$
 $f(x) = \frac{1}{x}$

7) a) $f^{-1}(x) = \frac{x+4}{6}$
or
 $f(x) = \frac{1}{6}x + \frac{2}{3}$
D: \mathbb{R} D: \mathbb{R}
R: \mathbb{R} R: \mathbb{R}

b) $f^{-1}(x) = \sqrt{x}-3$
 $f(x) = \sqrt{x}-3$
D: \mathbb{R} D: \mathbb{R}
R: \mathbb{R} R: \mathbb{R}

2) a) $f+g = \frac{3x-2}{x^2-49}$
D: $x \neq \pm 7$

b) $f-g = \frac{-x+4}{x^2-49}$
D: $x \neq \pm 7$

c) $f \cdot g = \frac{(x+1)(2x-3)}{(x^2-49)^2} = \frac{2x^2-x-3}{(x^2-49)^2}$
D: $x \neq \pm 7$

d) $\frac{f}{g} = \frac{x+1}{2x-3}$; D: $x \neq \pm 7, \frac{3}{2}$

4) $f \circ g = f(2-x^2)$

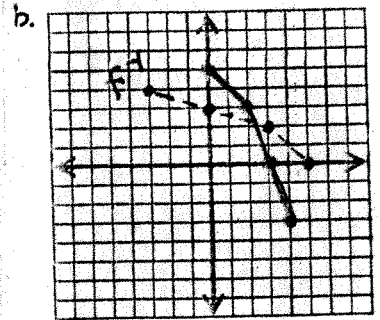
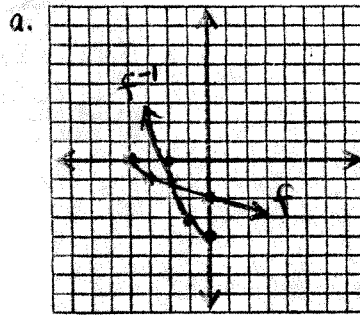
a) $\sqrt{(2-x^2)-3} = \sqrt{-x^2-1}$

b) $g \circ f$

$g(\sqrt{x-3}) = 2 - (\sqrt{x-3})^2$
 $2 - (x-3)$
 $2 - x + 3 = 5 - x$

D: $x-3 \geq 0$
 $x \geq 3$

6)



c) $f^{-1}(x) = \frac{2}{x-1}$
 $f(x) = \frac{2}{x-1}$
D: $x \neq 1$ D: $x \neq 1$
R: $y \neq 0$ R: $y \neq 0$

8) $f^{-1}(x) = \sqrt{x}-1$
 $f(x) = \sqrt{x}-1$
D: $x \geq -1$ D: $x \geq 0$
R: $y \geq 0$ R: $y \geq -1$

d) $f^{-1}(x) = \frac{x+2}{x-3}$
 $f(x) = \frac{x+2}{x-3}$
D: $x \neq 1$ D: $x \neq 3$
R: $y \neq 3$ R: $y \neq 1$

