

Exercise 1 and 2 Review – Practice Problems

Exercise 1

1. Find the Domain of the following functions

a) $f(x) = 1 - 18x$

No restrictions
 $x \in \mathbb{R}$ $D = \{x | x \in \mathbb{R}\}$

b) $g(x) = x^4 - x^2 + 15x$

No restrictions
 $x \in \mathbb{R}$ $D = \{x | x \in \mathbb{R}\}$

c) $h(x) = \sqrt{x-5}$


$x-5 \geq 0$
 $x \geq 5$
 $D = \{x | x \in \mathbb{R}, x \geq 5\}$

d) $F(x) = \sqrt[3]{-x}$ ← needs to be positive

so $-x \geq 0$
 $x \leq 0$
 $D = \{x | x \in \mathbb{R}, x \leq 0\}$

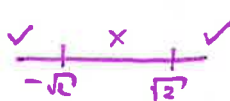
e) $G(x) = \sqrt{1-x^2}$

$1-x^2 \geq 0$
 $1 \geq x^2$
 $D = \{x | x \in \mathbb{R}, -1 \leq x \leq 1\}$



f) $H(x) = \sqrt{x^2-2}$

$x^2-2 \geq 0$
 $x^2 \geq 2$
 $|x| \geq \sqrt{2}$
 $D = \{x | x \in \mathbb{R}, |x| \geq \sqrt{2}\}$



g) $y = \frac{3+x}{3-x}$

← can't be 0
 $x \neq 3$
 $D = \{x | x \in \mathbb{R}, x \neq 3\}$

h) $y = \frac{x^2}{x^2+4x-5}$

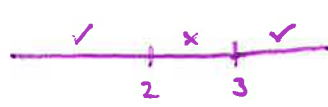
$(x+5)(x-1)$
 $D = \{x | x \in \mathbb{R}, x \neq -5, x \neq 1\}$

i) $y = \frac{1}{\sqrt{t^2+5}}$

← $t^2+5 > 0$
 $t^2 > -5$
 $t > \sqrt{-5}$ ← not a number.
 can't be zero either
 NO restrictions
 $D = \{t | t \in \mathbb{R}\}$

j) $y = \frac{t}{\sqrt{t^2-5t+6}}$

$(t-2)(t-3) > 0$
 $D = \{t | t \in \mathbb{R}, t < 2 \text{ or } t > 3\}$



k) $f(x) = \sqrt{x} + \sqrt{4-x}$

$x \geq 0$ $4-x \geq 0$
 $x \geq 0$ $4 \geq x$
 combine these
 $D = \{x | x \in \mathbb{R}, 0 \leq x \leq 4\}$

l) $f(x) = \sqrt{2-\sqrt{4-x}}$

$\sqrt{4-x} \leq 2$
 $4-x \geq 0$ $4-x \leq 4$
 $x \leq 4$ $x \geq 0$
 $D = \{x | x \in \mathbb{R}, 0 \leq x \leq 4\}$

Exercise 2

1. Find: $f \circ g, g \circ f, f \circ f$, and $g \circ g$

a) $f(x) = 2x - 1; g(x) = 4 - 3x$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$2(4-3x)-1$	$4-3(2x-1)$	$2(2x-1)-1$	$4-3(4-3x)$
$8-6x-1$	$4-6x+3$	$4x-2-1$	$4-12+9x$
$-6x+7$	$-6x+7$	$4x-3$	$9x-8$

b) $f(x) = x^2; g(x) = x + 1$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$(x+1)^2$	x^2+1	$(x^2)^2$	$x+1+1$
x^2+2x+1	x^2+1	x^4	$x+2$

c) $f(x) = 1 - x^2; g(x) = 5$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$1-5^2$	5	$1-(1-x^2)^2$	5
-24	5	$1-[1-2x^2+x^4]$	5
-24	5	$-x^4+2x^2$	5

d) $f(x) = \sqrt{x}; g(x) = x^2 - 4$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$\sqrt{x^2-4}$	$\sqrt{x^2-4}$	$\sqrt{\sqrt{x}}$	$(x^2-4)^2-4$
$\sqrt{x^2-4}$	$x-4$	$\sqrt[4]{x}$	x^4-8x^2+16-4
$\sqrt{x^2-4}$	$x-4$	$\sqrt[4]{x}$	x^4-8x^2+12

e) $f(x) = 3x - 5; g(x) = \frac{1}{x}$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$3\left(\frac{1}{x}\right) - 5$	$\frac{1}{3x-5}$	$3(3x-5) - 5$	$\frac{1}{\frac{1}{x}}$
$\frac{3}{x} - 5$		$9x - 15 - 5$	x
		$9x - 20$	

f) $f(x) = \frac{1}{1-x}; g(x) = \frac{x-2}{x+2}$

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

g) $f(x) = \sqrt{x}; g(x) = \sqrt{1+x}$

$f \circ g(x)$	$g \circ f(x)$	$f \circ f(x)$	$g \circ g(x)$
$\sqrt{\sqrt{1+x}}$	$\sqrt{1+\sqrt{x}}$	$\sqrt{\sqrt{x}}$	$\sqrt{1+\sqrt{1+x}}$
$(1+x)^{\frac{1}{4}}$		$\sqrt[4]{x}$	

2. Find functions f and g such that $h(x) = f(g(x))$

a) $h(x) = (2x+1)^9$

$g(x) = (2x+1)$
 $f(x) = x^9$

b) $h(x) = 1 + 2x^2 + 3x^4$

$g(x) = x^2$
 $f(x) = 1 + 2x + 3x^2$

c) $h(x) = \frac{1}{x^2-7}$

$g(x) = x^2 - 7$
 $f(x) = \frac{1}{x}$

d) $h(x) = \sqrt{6+x}$

$g(x) = 6+x$
 $f(x) = \sqrt{x}$