12) §2.4 #s 1, 2, 15-29, 51-59, 63-69, 105

(1) The function $f+g$ is the sum function.

(2) The function $f \circ g$ is the composition function.

#s 15-22 $f = \{(-3,1), (0,4), (2,0)\}$,
$g = \{(-3,2), (1,2), (2,6), (4,0)\}$,
$h = \{(2,4), (1,0)\}$

Find each of the following and its $\mathcal{D}$.

(15) $(f+g)(x) = \{(-3,3), (2,6)\}$
$\mathcal{D} = \{-3, 2\}$

(17) $(f-g)(x) = \{(-3,-1), (2,-6)\}$
$\mathcal{D} = \{-3, 2\}$

(19) $(f \cdot g)(x) = (fg)(x) = \{(-3,2), (2,0)\}$
$\mathcal{D} = \{-3, 2\}$

(21) $(g/f)(x) = \{(-3,2)\}$ ($f(2)=0$. Can't divide by 0.)
$\mathcal{D} = \{-3\}$

#s 23-30 $f(x) = \sqrt{x}$, $g(x) = x-4$, $h(x) = \frac{1}{x-2}$.

Find an eq'n & the following and $\mathcal{D}$.

(23) $(f+g)(x) = \sqrt{x} + x - 4$ $\mathcal{D} = \{x \mid x \geq 0\} = [0, \infty)$

(25) $(f-h)(x) = \sqrt{x} - \frac{1}{x-2}$ $\mathcal{D} = \{x \mid x \geq 0 \text{ and } x \neq 2\}$
$= [0,2) \cup (2, \infty)$

121 §2.4 #s 27, 29, 51-59, 63-69, 105

(27) $(g \cdot h)(x) = (gh)(x) = h(x) - 4 = \frac{1}{x-2} - 4$

$\mathcal{D} = \{x \mid x \neq 2\} = (-\infty, 2) \cup (2, \infty)$

(29) $\frac{g}{f} = \frac{x-4}{\sqrt{x}}$ $\mathcal{D} = \{x \mid x \geq 0 \text{ and } \sqrt{x} \neq 0\}$

$= \{x \mid x > 0\} = (0, \infty)$

#s 51-62 $f(x) = x-2$, $g(x) = \sqrt{x}$, $h(x) = \frac{1}{x}$

Same instructions as previous stretch.

$\mathcal{D}(f) = \mathbb{R}$, $\mathcal{D}(g) = [0, \infty)$, $\mathcal{D}(h) = (-\infty, 0) \cup (0, \infty)$

(51) $(f \circ g)(x) = f(g(x)) = \sqrt{x} - 2$

$\mathcal{D}(f \circ g) = \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$

$= \{x \mid x \geq 0 \text{ and } g(x) \in \mathbb{R}\}$

$= \{x \mid x \geq 0\} = [0, \infty)$

(53) $(f \circ h)(x) = f(h(x)) = \frac{1}{x} - 2$

$\mathcal{D}(f \circ h)(x) = \{x \mid x \neq 0 \text{ and } \frac{1}{x} \in \mathbb{R}\}$

$= \{x \mid x \neq 0\} = (-\infty, 0) \cup (0, \infty)$

(55) $(h \circ g)(x) = h(g(x)) = \frac{1}{\sqrt{x}}$

$\mathcal{D}(h \circ g)(x) = \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(h)\}$

$= \{x \mid x \geq 0 \text{ and } \sqrt{x} \neq 0\} = \{x \mid x > 0\} = (0, \infty)$

121 §2.4 #s 57, 59, 63-69, 105

(57) $(f \circ f)(x) = f(f(x)) = f(x) - 2 = (x-2) - 2$ OR $x-4$

$\mathcal{D}(f \circ f) = \mathbb{R} = (-\infty, \infty)$

(59) $(h \circ g \circ f)(x) = h(g(f(x)))$

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

$\mathcal{D}(h \circ g \circ f) = \{x \mid x \in \mathcal{D}(f)$ and $f(x) \in \mathcal{D}(g)$ and $g(f(x)) \in \mathcal{D}(h)\}$

$= \{x \mid x \in \mathbb{R}$ and $x-2 \geq 0$ and $\sqrt{x-2} \neq 0\}$

$= \{x \mid x \geq 2$ and $x-2 \neq 0\}$

$= \{x \mid x \geq 2$ and $x \neq 2\}$

$= \{x \mid x > 2\} = (2, \infty)$

~~#s~~ 63-72 $f(x) = |x|$, $g(x) = x-7$, $h(x) = x^2$

Write each of the following as a composition of f, g, and/or h!

(63) $F(x) = x^2 - 7 = h(x) - 7 = g(h(x)) = g \circ h$

(65) $H(x) = (x-7)^2 = (g(x))^2 = h \circ g$

121 §2.4 #s 67, 69, 105

(67) $N(x) = (|x| - 7)^2 = (f(x) - 7)^2 = (g(f(x)))^2$

$= h(g(f(x))) = h \circ g \circ f$

(69) $P(x) = |x - 7| - 7 = |g(x)| - 7 = f(g(x)) - 7$

$= g(f(g(x))) = g \circ f \circ g$

(105) Hamburgers cost \$1.20, so

$C(x) = 1.2x$ gives cost for x hamburgers.

Sales Tax is $.05 = 5\% \longrightarrow T(x) = 1.05x$

= Post-tax cost, where x = price of a hamburger. Then the total cost of hamburgers as a function of the # of hamburgers is

$1.05(1.20x) = \boxed{1.26x}$

Just an exercise in seeing compositions

$1.05 = 1 + .05 =$

$(1)(1.20) + (.05)(1.20)$

$= 1.20 + \frac{1}{20} \cdot 1.20$

$= 1.20 + .06$