

## 2.7 Function Operations P. 106 2, 6, 7, 9-20

2.  $f(x) = x^2 + 3x$       $g(x) = 2x - 5$

a)  $(f+g)(2)$

$$= x^2 + 3x + 2x - 5$$

$$= x^2 + 5x - 5$$

$$= (2)^2 + 5(2) - 5$$

$$= \textcircled{9}$$

b)  $(f-g)(-2)$

$$(x^2 + 3x) - (2x - 5)$$

$$= x^2 + x + 5$$

$$= (-2)^2 + (-2) + 5$$

$$= \textcircled{7}$$

c)  $(fg)(-1)$

$$= (x^2 + 3x)(2x - 5)$$

$$= 2x^3 - 5x^2 + 6x^2 - 15x$$

$$= 2(-1)^3 + 1(-1)^2 - 15(-1)$$

$$= -2 + 1 + 15 = \textcircled{14}$$

d)  $\left(\frac{f}{g}\right)(3)$

$$= \frac{x^2 + 3x}{2x - 5}$$

$$= \frac{(3)^2 + 3(3)}{2(3) - 5} = \textcircled{18}$$

e)  $(f \circ g)(1)$

$$= (2x - 5)^2 + 3(2x - 5)$$

$$= 4x^2 - 20x + 25 + 6x - 15$$

$$= 4x^2 - 14x + 10$$

$$= 4(1)^2 - 14(1) + 10$$

$$= \textcircled{0}$$

f)  $(g \circ f)(-3)$

$$= 2(x^2 + 3x) - 5$$

$$= 2x^2 + 6x - 5$$

$$= 2(-3)^2 + 6(-3) - 5$$

$$= 18 - 18 - 5 = \textcircled{-5}$$

g)  $(f \circ f)(4)$

$$= (x^2 + 3x)^2 + 3(x^2 + 3x)$$

$$= x^4 + 6x^3 + 9x^2 + 3x^2 + 9x$$

$$= x^4 + 6x^3 + 12x^2 + 9x$$

$$= (4)^4 + 6(4)^3 + 12(4)^2 + 9(4)$$

$$= 256 + 384 + 192 + 36$$

$$= \textcircled{868}$$

h)  $(g \circ g)(-4)$

$$= 2(2x - 5) - 5$$

$$= 4x - 10 - 5$$

$$= 4x - 15$$

$$= 4(-4) - 15$$

$$= -16 - 15 = \textcircled{-31}$$

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

a)  $(f+g)(x)$

$$= \frac{2x+1}{x} + \frac{x-1}{2}$$

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

$$= \frac{4x+2+x^2-x}{2x}$$

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

b)  $(f-g)(x)$

$$= \frac{2x+1}{x} - \frac{x-1}{2}$$

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

$$= \frac{4x+2-x^2+x}{2x}$$

$$= \textcircled{\frac{-x^2+5x+2}{2x}}$$

$$\begin{aligned}
 & \text{b) c) } (fg)(x) \\
 & \left(\frac{2x+1}{x}\right)\left(\frac{x-1}{2}\right) \\
 & \frac{2x^2 - 2x + x - 1}{2x} \\
 & = \frac{2x^2 - x - 1}{2x}
 \end{aligned}$$

$$\begin{aligned}
 & \text{d) } \left(\frac{f}{g}\right)(x) \\
 & = \frac{\left(\frac{2x+1}{x}\right)}{\left(\frac{x-1}{2}\right)} \\
 & = \left(\frac{2x+1}{x}\right)\left(\frac{2}{x-1}\right) \\
 & = \frac{4x+2}{x^2-x}
 \end{aligned}$$

$$\begin{aligned}
 & \text{e) } (f \circ g)(x) \\
 & = \frac{2\left(\frac{x-1}{2}\right) + 1}{\left(\frac{x-1}{2}\right)} \\
 & \frac{x-1+1}{\frac{x-1}{2}} \\
 & = \frac{2x}{x-1}
 \end{aligned}$$

$$\begin{aligned}
 & \text{f) } (g \circ f)(x) \\
 & = \frac{\left(\frac{2x+1}{x}\right) - 1}{2} \\
 & = \frac{(2x+1-x)\left(\frac{1}{2}\right)}{x} \\
 & = \frac{x+1}{2x}
 \end{aligned}$$

$$\begin{aligned}
 & \text{g) } (F \circ f)(x) \\
 & = \frac{2\left(\frac{2x+1}{x}\right) + 1}{2x+1} \\
 & = \frac{(4x+2+x)\left(\frac{x}{2x+1}\right)}{2x+1} \\
 & = \frac{5x+2}{2x+1}
 \end{aligned}$$

$$\begin{aligned}
 & \text{h) } (g \circ g)(x) \\
 & = \frac{\left(\frac{x-1}{2}\right) - 1}{2} \\
 & = \frac{(x-1-2)\left(\frac{1}{2}\right)}{2} \\
 & = \frac{x-3}{4}
 \end{aligned}$$

7.  $f(x) = x^2$ ,  $g(x) = \sqrt{16-x^2}$

$$\begin{aligned}
 & \text{a) } (f \circ g)(x) \\
 & = \sqrt{16-x^2}^2
 \end{aligned}$$

$$\{x: x \in [-4, 4]\}$$

$$\begin{aligned}
 & \text{b) } (g \circ f)(x) \\
 & = \sqrt{16-x^2}^2 \\
 & = \sqrt{16-x^4}
 \end{aligned}$$

$$\{x: x \in [-2, 2]\}$$