

$$\textcircled{1} (f+g)(x) = f(x) + g(x) \Rightarrow 7x^2 + 5x + x^2 - 13$$

$$\begin{aligned} f(x) &= 7x^2 + 5x \\ g(x) &= x^2 - 13 \end{aligned}$$

$$= 7x^2 + 1x^2 + 5x - 13$$

$$= \boxed{8x^2 + 5x - 13}$$

$$\textcircled{1} (f-g)(x) = f(x) - g(x) \Rightarrow 7x^2 + 5x - (x^2 - 13)$$

$$= 7x^2 + 5x - 1x^2 + 13$$

$$= 7x^2 - 1x^2 + 5x + 13$$

$$= \boxed{6x^2 + 5x + 13}$$

$$\textcircled{2} (f+g)(x) = f(x) + g(x) \Rightarrow 41 - 5x + 13x^2$$

$$\begin{aligned} f(x) &= 41 - 5x \\ g(x) &= 13x^2 \end{aligned}$$

$$= \boxed{13x^2 - 5x + 41}$$

$$\textcircled{2} (f-g)(x) = f(x) - g(x) \Rightarrow 41 - 5x - (13x^2)$$

$$= 41 - 5x - 13x^2$$

$$= \boxed{-13x^2 - 5x + 41}$$

(3)

$$f(x) = x^2 + \frac{1}{3}x + 9$$

$$g(x) = -7x - 7$$

$$(f+g)(x) = f(x) + g(x)$$

$$= x^2 + \frac{1}{3}x + 9 + -7x - 7$$

$$= x^2 + \frac{1}{3}x - 7x + 9 - 7$$

$$= x^2 - (\frac{20}{3})x + 2$$

$$= \boxed{x^2 - \frac{20}{3}x + 2}$$

$$(f-g)(x) = f(x) - g(x)$$

$$= x^2 + \frac{1}{3}x + 9$$

$$- (-7x - 7)$$

$$= x^2 + \frac{1}{3}x + 9 + 7x + 7$$

$$= x^2 + \frac{1}{3}x + 7x + 9 + 7$$

$$= \boxed{x^2 + \frac{22}{3}x + 16}$$

$$\text{Note } \frac{1}{3} - 7 = -\frac{20}{3}$$

$$\frac{1}{3} + 7 = \frac{22}{3}$$

$$\text{Note } \frac{1}{3} + 7 = 7\frac{1}{3}$$

$$\frac{1}{3} + \frac{21}{3} = \frac{22}{3}$$

$$\textcircled{4} \quad f(x) = -9x^2 + 6 \quad g(x) = 12x^2$$

$$(f+g)(x) = f(x) + g(x) = -9x^2 + 6 + 12x^2 \\ = 12x^2 - 9x^2 + 6$$

$$= \boxed{3x^2 + 6}$$

$$(f-g)(x) = f(x) - g(x) = -9x^2 + 6 - (12x^2)$$

$$= -9x^2 + 6 - 12x^2 \\ = -9x^2 - 12x^2 + 6$$

$$= \boxed{-21x^2 + 6}$$

$$\textcircled{5} \quad f(x) = 35x + 5 \quad g(x) = 5$$

$$(f \circ g)(x) = [f(g(x))] [5(x)] = (35x+5)(5)$$

$$(f \circ g)(x) = 175x + 25$$

$$\frac{f}{g}(x) = \frac{f(x)}{g(x)} = \frac{35x+5}{5} = \frac{5(7x+1)}{5}$$

$$\frac{f}{g}(x) = \frac{35x+5}{5} = 7x+1$$

$x \in \mathbb{R}$   
no restrictions

$$⑥ \quad f(x) = x^2 + 25 \quad g(x) = 3x + 17$$

$$\begin{aligned} (fg)(x) &= [f(x)][g(x)] = (x^2 + 25)(3x + 17) \\ &= x^2(3x) + 25(3x) + 17(x^2) + 25(17) \\ &= 3x^3 + 75x + 17x^2 + 425 \\ &= \boxed{3x^3 + 17x^2 + 75x + 425} \end{aligned}$$

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{x^2 + 25}{3x + 17}$$

with  $x \neq \frac{-17}{3}$

note  $0 = 3x + 17$

$$\frac{-17}{3}$$

$$\frac{-17}{3} = \frac{3x}{3}$$

$$\boxed{x = \frac{-17}{3}}$$

$$\textcircled{7} \quad f(x) = x^2 + 16 \quad g(x) = x^2 - 16$$

$$\begin{aligned} (fg)(x) &= [f(x)][g(x)] = (x^2 + 16)(x^2 - 16) \\ &= (x^2)(x^2) - 16x^2 + 16x^2 - 16(16) \\ &= x^4 + 16x^2 - 16x^2 - 256 \\ &= x^4 + 0x^2 - 256 \\ &= \boxed{x^4 - 256} \end{aligned}$$

$$\left( \frac{f}{g} \right)(x) = \frac{f(x)}{g(x)} = \frac{x^2 + 16}{x^2 - 16} \quad \text{with } x \neq -4, 4$$

Note  $x^2 - 16 = 0$

$$\frac{+16 + 16}{x^2 = 16}$$

$$\sqrt{x^2} = \pm \sqrt{16}$$

$$\boxed{x = \pm 4}$$

$$f(x) = -2x - 2$$

$$g(x) = x + 10$$

$$\textcircled{8} (f+g)(x) = f(x) + g(x) = -2x - 2 + x + 10$$

$$= -2x + 1x - 2 + 10$$

$$= \boxed{-1x + 8}$$

$$\textcircled{9} (f-g)(x) = f(x) - g(x) = -2x - 2 \quad \ominus (x + 10)$$

$$= -2x - 2 - 1x - 10$$

$$= -2x - 1x - 2 - 10$$

$$= \boxed{-3x - 12}$$

$$\textcircled{10} (g-f)(x) = g(x) - f(x) = x + 10 \quad \ominus (-2x - 2)$$

$$= 1x + 10 + 2x + 2$$

$$= 1x + 2x + 10 + 2$$

$$= \boxed{3x + 12}$$

$$f(x) = -2x - 2 \quad g(x) = x + 10$$

$$\begin{aligned} (11) \quad (fg)(x) &= (f \circ g)(g(x)) = (-2x - 2)(x + 10) \\ &= -2x(x) - 2(x) - 2x(10) - 2(10) \\ &= -2x^2 - 2x - 20x - 20 \\ (fg)(x) &= -2x^2 - 22x - 20 \end{aligned}$$

$$(12) \quad \left( \frac{f}{g} \right)(x) = \frac{f(x)}{g(x)} = \frac{-2x - 2}{x + 10} \quad \text{with } x \neq -10$$

Note  $x + 10 = 0$   
 $-10 - 10$

$x = -10$

$$(13) \quad \left( \frac{g}{f} \right)(x) = \frac{g(x)}{f(x)} = \frac{x + 10}{-2x - 2} \quad \text{with } x \neq -1$$

Note  $-2x - 2 = 0$

$$\begin{array}{r} +2 \quad +2 \\ \hline -2x = 2 \end{array} \rightarrow$$

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



$$(14) (f \circ g)(x) = f(g(x)) = f\left(\frac{1}{3}(x+2)\right)$$

$$= 3\left(\frac{1}{3}(x+2)\right) - 2$$

$$= 3\left(\frac{1}{3}x + \frac{2}{3}\right) - 2$$

$$= \frac{3}{3}x + \frac{6}{3} - 2$$

$$= 1x + 2 - 2$$

$$= \boxed{1x}$$

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$$g \circ f(x) = g(f(x)) = g(3x-2)$$

$$= \frac{1}{3}[(3x-2)+2] = \frac{1}{3}[3x-2+2]$$

$$= \frac{1}{3}[3x] = \frac{3}{3}x = \boxed{1x}$$

$$(14) (f \circ g)(x) = f(g(x)) = f(x^2 - 1)$$

$$\begin{array}{l} f(x) = 4x \\ g(x) = x^2 - 1 \end{array}$$

$$= 4(x^2 - 1)$$

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

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

$$= (4x)^2 - 1$$

$$= (4x)(4x) - 1$$

$$= 16x^2 - 1$$

$$(16) \quad (f \circ g)(x) = f(g(x)) = f(x)$$

$$f(x) = -1x^2 + 1 = -1(x)^2 + 1$$

$$g(x) = x = \boxed{-1x^2 + 1}$$

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

$$= (-1x^2 + 1)$$

$$= \boxed{-1x^2 + 1}$$

$$f(x) = 11x$$

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

$$h(x) = 2(x - 4)$$

$$\textcircled{17} (f \circ g)(-1) = f(g(-1)) = f(-4)$$

$$= 11(-4)$$

$$\text{note } g(-1) = (-1)^2 - 5$$

$$= 1 - 5$$

$$= -4$$

$$= \boxed{-44}$$

$$\textcircled{18} (h \circ f)(-2) = h(f(-2))$$

$$= h(-22)$$

$$\text{note } f(-2) = 11(-2)$$

$$= -22$$

$$= 2((-22) - 4)$$

$$= 2(-26)$$

$$= \boxed{-52}$$

$$\textcircled{19} (h \circ g)(2) = h(g(2))$$

$$= h(-1)$$

$$\text{note } g(2) = (2)^2 - 5$$

$$= 4 - 5$$

$$= -1$$

$$= 2((-1) - 4)$$

$$= 2(-5)$$

$$= \boxed{-10}$$

$$f(x) = 11x \quad g(x) = x^2 - 5 \quad h(x) = 2(x - 4)$$

$$(20) \quad (g \circ h)(4) \rightarrow g(h(4)) \rightarrow g(0) = 0^2 - 5 = 0 - 5$$

$$\text{Note } h(4) = 2(4 - 4) = 2(0) = 0$$

$$g(0) = -5$$

$$(21) \quad (g \circ f)(0) = g(f(0)) \rightarrow g(0) = 0^2 - 5 = 0 - 5$$

$$\text{Note } f(0) = 11(0) = 0$$

$$g(0) = -5$$

$$(23) \quad (f \circ g)(0) = f(g(0)) \Rightarrow f(-5) = 11(-5)$$

$$\text{Note } g(0) = 0^2 - 5 = 0 - 5 = -5$$

$$f(-5) = -55$$

$$f(x) = 11x$$

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

$$h(x) = 2(x - 4)$$

$$\textcircled{24} \quad (h \circ h)(-1) = h(h(-1)) \longrightarrow h(-10) = 2(-10 - 4)$$

$$\text{Note } h(-1) = 2(-1 - 4)$$

$$= 2(-5)$$

$$h(-10) = 2(-10 - 4)$$

$$h(-1) = -10$$

$$h(-10) = -28$$

$$\textcircled{25} \quad (f \circ f)(2)$$

$$f(f(2)) \longrightarrow f(22) = 11(22)$$

$$\text{Note } f(2) = 11(2)$$

$$= 22$$

$$f(22) = 242$$