# Section [redacted] 3.4

1-18: Consider the functions defined by and find the requested function values.

$k(x) = \frac{2}{x+3}$ / $f(x) = 3x+4$ / $g(x) = x^2+5x+6$ / $h(x) = 4$

1) $f(3) = 3(3)+4$

$f(3) = 9+4$

$\boxed{f(3) = 13}$

5) $h(2) = 4$

no place to put the 2, all answers involving $h(x)$ will be 4

$\boxed{h(2)=4}$

9) $f(b) = \underbrace{3b+4}$

do not set this equal to 0

no algebra to do to get this answer

$\boxed{f(b) = 3b+4}$

13) $g(2a) = (2a)^2 + 5(2a)+6$

$g(2a) = 4a^2 + 10a + 6$

$g(2a) = 2(2a^2+5a+3)$

$\boxed{g(2a) = 2(2a+3)(a+1)}$

3) $g(1) = (1)^2 + 5(1) + 6$

$g(1) = 1+5+6$

$\boxed{g(1) = 12}$

7) $k(-5) = \frac{2}{-5+3}$

$k(-5) = \frac{2}{-2}$

$\boxed{k(-5) = -1}$

11) $f(b+1) = 3(b+1)+4$

$f(b+1) = 3b+3+4$

$\boxed{f(b+1) = 3b+7}$

15) $g(x-2) = (x-2)^2 + 5(x-2) + 6$

$= (x-2)(x-2) + 5(x-2) + 6$

$= x^2 - 2x - 2x + 4 + 5x - 10 + 6$

$= x^2 - 4x + 5x + 4 - 10 + 6$

$= x^2 - 4x + 5x - 6 + 6$

$= x^2 + x + 0$

$= x^2 + x$

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

17) $K(a)=\frac{2}{a+3}$

no algebra can be done to reduce

$$\boxed{K(a)=\frac{2}{a+3}}$$

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19-27: Let $f(x)=2x+3$ and $g(x)=2x^2+5x+3$ Find each function.

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

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

$=2x^2+7x+6$

$$\boxed{(f+g)(x)=(2x+3)(x+2)}$$

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21) $(f/g)(x)=\frac{2x+3}{2x^2+5x+3}$

$=\frac{\cancel{2x+3}}{\cancel{(2x+3)}(x+1)}$

$$\boxed{(f/g)(x)=\frac{1}{x+1}}$$

23) $(g/f)(x)=\frac{2x^2+5x+3}{2x+3}$

$=\frac{\cancel{(2x+3)}(x+1)}{\cancel{2x+3}}$

$$\boxed{(g/f)(x)=x+1}$$

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25) $(g\circ f)(x)=2(2x+3)^2+5(2x+3)+3$

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

$=2(4x^2+6x+6x+9)+5(2x+3)+3$

$=8x^2+12x+12x+18+10x+15x+3$

$=8x^2+34x+36$

$=2(4x^2+17x+18)$

$=\boxed{2(4x+9)(x+2)}$

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

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

$= -2x^2 - 3x$

$\boxed{(f-g)(x) = -x(2x+3)}$

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

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

$= -2x^2 + 6x$

$\boxed{(g-f)(x) = -2x(x-3)}$

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31) $(g \cdot f)(x) = (x-3)(2x^2-5x-3)$

$x(2x^2) \quad x(-5x) \quad x(-3) \quad -3(-2x^2) \quad -3(-5x) \quad -3(-3)$

$(g \cdot f)(x) = 2x^3 - 5x^2 - 3x - 6x^2 + 15x + 9$

$\boxed{(g \cdot f)(x) = 2x^3 - 11x^2 + 12x + 9}$

OR

$\boxed{(g \cdot f)(x) = (x-3)(2x^2-5x-3)}$

doesn't want factored answer as original problem is already factored

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33) $(f \circ g)(x) = 2(x-3)^2 - 5(x-3) - 3$

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

$= 2(x^2 - 3x - 3x + 9) - 5(x-3) - 3$

$= 2x^2 - 6x - 6x + 18 - 5x + 15 - 3$

$= 2x^2 - 17x + 30$

$\boxed{(f \circ g)(x) = (2x-5)(\cancel{2}x-6)}$

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

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

$= 2x^2 - 4x - 6$

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

$\boxed{(g+f)(x) = 2(x+1)(x-3)}$

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37) $(h+k)(x) = (x^2 + 2x + 1) + (2x - 5)$

$(h+k)(3) = (3^2 + 2(3) + 1) + (2(3) - 5)$

$= 9 + 6 + 11 + (6-5)$

$= 16 + 1$

$\boxed{(h+k)(3) = 17}$

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39) $(h/k)(x) = \dfrac{x^2 + 2x + 1}{2x - 5}$

$(h/k)(5) = \dfrac{5^2 + 2(5) + 1}{2(5) - 5}$

$= \dfrac{25 + 10 + 1}{10 - 5}$

$\boxed{(h/k)(5) = \dfrac{36}{5}}$

41) $(h-k)(x) = (x^2 + 2x + 1) - (2x - 5)$

$(h-k)(7) = (7^2 + 2(7) + 1) - (2(7) - 5)$

$= (49 + 14 + 1) - (14 - 5)$

$= 64 - 9$

$\boxed{(h-k)(7) = 55}$

43) $(h \circ k)(x) = (2x-5)^2 + 2(2x-5)+1$

$(h \circ k)(4) = (2(4)-5)^2 + 2(2(4)-5)+1$

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

$= 9+6+1$

$\boxed{(h \circ k)(4) = 16}$

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45) $(k \circ h)(x) = 2(x^2+2x+1) - 5$

$(k \circ h)(3) = 2(3^2+2(3)+1)-5$

$= 2(16)-5$

$= 32-5$

$\boxed{(k \circ h)(3) = 27}$

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47) $(k \circ h)(x) = 2(x^2+2x+1) - 5$

$(k \circ h)(1) = 2(1^2+2(1)+1)-5$

$= 2(4) - 5$

$= 8-5$

$\boxed{(k \circ h)(1) = 3}$

49) $(s/t)(x) = \dfrac{x^2+5x-3}{2x-7}$

$(s/t)(3) = \dfrac{3^2+5(3)-3}{2(3)-7}$

$= \dfrac{9+15-3}{6-7}$

$= \dfrac{21}{-1}$

$\boxed{(s/t)(3) = -21}$

51) $(t+s)(x) = (2x-7) + (x^2+5x-3)$

$(t+s)(6) = (2(6)-7) + (6^2+5(6)-3)$

$= (12-7) + (36+30-3)$

$= 5+63$

$\boxed{(t+3)(6) = 68}$

53) $(s \circ t)(x) = (2x-7)^2 + 5(2x-7) - 3$

$(s \circ t)(0) = (2(0)-7)^2 + 5(2(0)-7) - 3$

$= (-7)^2 + 5(-7) - 3$

$= 49 - 35 - 3$

$\boxed{(s \circ t)(0) = 11}$

55) $(s \circ t)(x) = (2x-7)^2 + 5(2x-7) - 3$

$(s \circ t)(-2) = (2(-2)-7)^2 + 5(2(-2)-7) - 3$

$= (-11)^2 + 5(-11) - 3$

$= 121 - 55 - 3$

$\boxed{(s \circ t)(-2) = 63}$

57) $(t \circ s)(x) = 2(x^2+5x-3) - 7$

$(t \circ s)(-6) = 2((-6)^2 + 5(-6) - 3) - 7$

$= 2(36-30-3) - 7$

$= 2(3) - 7$

$\boxed{(t \circ s)(-6) = -1}$

59) $f(x) = 3x-7$

$f(x+h) = 3(x+h) - 7$

$= 3x + 3h - 7$

$h = h$

put these in the formula, $\frac{f(x+h)-f(x)}{h}$

$$\frac{f(x+h)-f(x)}{h} = \frac{(3x+3h-7)-(3x-7)}{h}$$

$$= \frac{3x+3h-7-3x+7}{h}$$

$$= \frac{3h}{h}$$

$$= \boxed{3}$$

61) $f(x) = 9x - 5$

$f(x+h) = 9(x+h) - 5$

$= 9x + 9h - 5$

$h = h$

put these in the formula, $\frac{f(x+h)-f(x)}{h}$

$$\frac{f(x+h)-f(x)}{h} = \frac{(9x+9h-5)-(9x-5)}{h}$$

$$= \frac{9x+9h-5-9x+5}{h}$$

$$= \frac{9h}{h}$$

$$= \boxed{9}$$

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

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

$= (x+h)(x+h) + 1$

$= x^2 + 1xh + 1xh + h^2 + 1$

$= x^2 + 2xh + h^2 + 1$

$h = h$

put these in the formula, $\frac{f(x+h)-f(x)}{h}$

$$\frac{f(x+h)-f(x)}{h} = \frac{(x^2+2xh+h^2+1)-(x^2+1)}{h}$$

$$= \frac{x^2+2xh+h^2+1-x^2-1}{h}$$

$$= \frac{2xh+h^2}{h}$$

$$= \frac{h(2x+h)}{h}$$

$$= \boxed{2x+h}$$

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

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

$$= (x+h)(x+h) + 5(x+h) - 3$$

$$= x^2 + 1xh + 1xh + h^2 + 5x + 5h - 3$$

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

put these in the formula

$h = h$

$$\frac{f(x+h) - f(x)}{h} = \frac{(x^2 + 2xh + h^2 + 5x + 5h - 3) - (x^2 + 5x - 3)}{h}$$

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

$$= \frac{2xh + h^2 + 5h}{h}$$

$$= \frac{h(2x + h + 5)}{h}$$

$$= \boxed{2x + h + 5}$$

67) $f(x) = x^2 - 5x + 8$

$f(x+h) = (x+h)^2 - 5(x+h) + 8$

$= (x+h)(x+h) - 5(x+h) + 8$

$= x^2 + 1xh + 1xh + h^2 - 5x - 5h + 8$

$= x^2 + 2xh + h^2 - 5x - 5h + 8$

$h = h$

put these in the formula $\frac{f(x+h) - f(x)}{h}$

$$\frac{f(x+h) - f(x)}{h} = \frac{(x^2 + 2xh + h^2 - 5x - 5h + 8) - (x^2 - 5x + 8)}{h}$$

$$= \frac{x^2 + 2xh + h^2 - 5x - 5h + 8 - x^2 + 5x - 8}{h}$$

$$= \frac{2xh + h^2 - 5h}{h}$$

$$= \frac{h(2x + h - 5)}{h}$$

$$= \boxed{2x + h - 5}$$