Composition of Function Notes

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

* inside → out

Find the rule given the functions: $f(x) = x^2 - 7$ $g(x) = 3x + 2$ $h(x) = \sqrt{x+1}$

1. $f(-3)$ $x = -3$

$= (-3)^2 - 7$

$= 9 - 7$

$= \boxed{2}$

2. $h(8)$ $x = 8$

$= \sqrt{8+1}$

$= \sqrt{9}$

$= \boxed{3}$

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

$(x^2 - 7) + (3x + 2)$

$x^2 - 7 + 3x + 2$

$\boxed{x^2 + 3x - 5}$

4. $(fg)(x) = f(x) \cdot g(x)$

$(x^2 - 7)(3x + 2)$

$\boxed{3x^3 + 2x^2 - 21x - 14}$

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

$(x^2 - 7) - (3x + 2)$

$x^2 - 7 - 3x - 2$

$\boxed{x^2 - 3x - 9}$

6. $(f/g)(x) = f(x)/g(x)$

$\boxed{\dfrac{x^2 - 7}{3x + 2}}$

7. $g(f(12))$

$f(12) = 12^2 - 7 = 137$

$g(137) = 3(137) + 2 = 413$

$\boxed{413}$

8. $f(g(7))$

$g(7) = 3(7) + 2$
$= 23$

$f(23) = 23^2 - 7$
$= 522$

$\boxed{522}$

9. $f(g(x))$ $3x + 2$

$f(3x + 2)$

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

$= 9x^2 + 6x + 6x + 4 - 7$

$= \boxed{9x^2 + 12x - 3}$

10. $(f+g)(2)$

$f(2) + g(2)$

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

$= 4 - 7$ $= 8$

$= -3$

$-3 + 8 = \boxed{5}$

11. $g(f(x))$ $x^2 - 7$

$g(x^2 - 7) = 3(x^2 - 7) + 2$

$= 3x^2 - 21 + 2$

$= \boxed{3x^2 - 19}$

12. $(f \circ h)(x) = f(h(x))$ $\sqrt{x+1}$

$f(\sqrt{x+1})$

$= (\sqrt{x+1})^2 - 7$

$= x + 1 - 7$

$= \boxed{x - 6}$

13. Find the domain restrictions for #6.

(the denom $\neq 0$)

$3x + 2 = 0$

$x = -2/3$ → $\boxed{x \neq -2/3}$

14. $(f-g)(4) = f(4) - g(4)$

$f(4) = 4^2 - 7 = 16 - 7 = 9$

$g(4) = 3(4) + 2 = 12 + 2 = 14$

$9 - 14 = \boxed{-5}$