Composition of Functions

Combining two formulas into one using substitution.

Algorithm for finding the composition of f(g(x))

1. **Write the rule for f(x)**
2. **Everywhere you see an x in f(x), substitute g(x)**
3. **Using 2, substitute the rule for g(x) everywhere you see g(x) in the rule**
4. **Simplify**

Example: If $f(x) = 3x - 2$ and $g(x) = 5x + 1$, find $f(g(x))$

1. $f(x) = 3x - 2$
2. $f(g(x)) = 3g(x) - 2$
3. $= 3(5x + 1) - 2$
4. $= 15x + 3 - 2 \implies 15x + 1$

Using the following functions, find the compositions.

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

1. f(g(x)) **2. f(h(x))** **3. j(h(x))**

4. g(h(x)) **5. h(f(x))** **6. h(j(x))**

7. f(f(x)) **8. h(h(x))** **9. f(j(x))**

10. g(f(x)) **11. j(g(x))** **12. g(g(x))**