1. Let $f(x) = 3x + 1, g(x) = x^2 - 2x - 4$, and $h(x) = \dfrac{x}{4}$.
   Compute the following and simplify.

   (a) $(f+g)(x)$ $x^2 + x - 3$
   (b) $(f-g)(x)$ $-x^2 + 5x + 5$
   (c) $(f-g)(10)$ -45
   (d) $(fg)(x)$ $3x^3 - 5x^2 - 14x - 4$
   (e) $(hf)(x)$ $\dfrac{3x^2 + x}{4}$
   (f) $(fg)(-1) + (hf)(1)$ 3
   (g) $\left(\dfrac{f}{g}\right)(0)$ $-\dfrac{1}{4}$
   (h) $(f \circ h)(x)$ $\dfrac{3x}{4} + 1$
   (i) $(h \circ f)(x)$ $\dfrac{3x+1}{4}$
   (j) $\dfrac{f(b) - f(a)}{b - a}$ 3

2. Let $f(x) = 5x^2, g(x) = \dfrac{1}{1-2x}$, and $h(x) = |x|$.
   Compute the following and simplify.

   (a) $(g \circ f)(x)$ $\dfrac{1}{1 - 10x^2}$
   (b) $(f \circ g)(x)$ $\dfrac{5}{(1-2x)^2}$
   (c) $(h \circ f)(x)$ $5x^2$
   (d) $(f \circ g \circ f)(x)$ $\dfrac{5}{(1-10x^2)^2}$

3. Write each function as a composition of two simpler functions. (Answers may vary.)

   (a) $\sqrt{2x+1}$ If $f(x) = 2x + 1$ and $g(x) = \sqrt{x}$, then $(g \circ f)(x) = \sqrt{2x+1}$.
   (b) $\dfrac{1}{x-4}$ If $f(x) = x - 4$ and $g(x) = \dfrac{1}{x}$, then $(g \circ f)(x) = \dfrac{1}{x-4}$.
   (c) $\dfrac{x^2-3}{x^2-1}$ If $f(x) = x^2$ and $g(x) = \dfrac{x-3}{x-1}$, then $(g \circ f)(x) = \dfrac{x^2-3}{x^2-1}$.
   (d) $16x^2$ If $f(x) = x^2$ and $g(x) = 16x$, then $(g \circ f)(x) = 16x^2$.

4. Write each function as a composition of three simpler functions. (Answers may vary.)

   (a) $(5x-2)^3$ If $f(x) = 5x$, $g(x) = x - 2$, and $h(x) = x^3$, then $(h \circ g \circ f)(x) = (5x-2)^3$.
   (b) $\dfrac{2}{\sqrt[3]{x+4}}$ If $f(x) = x + 4$, $g(x) = \sqrt[3]{x}$, and $h(x) = \dfrac{2}{x}$, then $(h \circ g \circ f)(x) = \dfrac{2}{\sqrt[3]{x+4}}$.