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

   (a) $(f + g)(x)$
       Solution: $x^2 + x - 3$

   (b) $(f - g)(x)$
       Solution: $-x^2 + 5x + 5$

   (c) $(f - g)(10)$
       Solution: -45

   (d) $(fg)(x)$
       Solution: $3x^3 - 5x^2 - 14x - 4$

   (e) $(hf)(x)$
       Solution: $\frac{3x^2 + x}{4}$

   (f) $(fg)(-1) + (hf)(1)$
       Solution: 3

   (g) $\left(\dfrac{f}{g}\right)(0)$
       Solution: $-\frac{1}{4}$

   (h) $(f \circ h)(x)$
       Solution: $\frac{3x}{4} + 1$

   (i) $(h \circ f)(x)$
       Solution: $\frac{3x+1}{4}$

   (j) $\dfrac{f(b) - f(a)}{b - a}$
       Solution: 3

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

   (a) $(g \circ f)(x)$
       Solution: $\frac{1}{1-10x^2}$

   (b) $(f \circ g)(x)$
       Solution: $\frac{5}{(1-2x)^2}$

   (c) $(h \circ f)(x)$
       Solution: $5x^2$

   (d) $(f \circ g \circ f)(x)$
       Solution: $\frac{5}{(1-10x^2)^2}$

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

   (a) $\sqrt{2x + 1}$
       Possible Solution: $f(x) = \sqrt{x + 1}, g(x) = 2x$

   (b) $\dfrac{1}{x - 4}$
       Possible Solution: $f(x) = \frac{1}{x}, g(x) = x - 4$

   (c) $\dfrac{x^2 - 3}{x^2 - 1}$
       Possible Solution: $f(x) = \frac{x-3}{x-1}, g(x) = x^2$

   (d) $16x^2$
       Possible Solution: $f(x) = 4x, g(x) = 4x^2$

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

   (a) $(5x - 2)^3$
       Possible Solution: $f(x) = x^3, g(x) = x - 2, h(x) = 5x$

   (b) $\dfrac{2}{\sqrt[3]{x + 4}}$
       Possible Solution: $f(x) = 2x, g(x) = \frac{1}{\sqrt[3]{x}}, h(x) = x + 4$