Different quotient (and similar) practice problems

1. For each of the following functions, simplify the expression
   \[
   f(x + h) - f(x) \over h
   \]
as far as possible. In particular, you should be able to rewrite each expression without an \(h\) in the denominator.

   (a) \(f(x) = 2x + 5\)
   (b) \(f(x) = 3 - x\)
   (c) \(f(x) = x^2\)
   (d) \(f(x) = 2x^2 - x\)
   (e) \(f(x) = \frac{1}{2}x^2 + 3x - 4\)
   (f) \(f(x) = \sqrt{x}\)
   (g) \(f(x) = \sqrt{x^2 - 1}\)

2. For each of the following functions, simplify the expression
   \[
   f(x + h) - f(x + 2h) \over h
   \]
as far as possible. In particular, you should be able to rewrite each expression without an \(h\) in the denominator.

   (a) \(f(x) = 5\)
   (b) \(f(x) = x + 3\)
   (c) \(f(x) = \frac{2}{3}x^2 - 1\)
   (d) \(f(x) = x^2 + 4x - 6\)

Answers:

1. (a) 2
   (b) -1
   (c) \(2x + h\)
   (d) \(4x + 2h - 1\)
   (e) \(x + \frac{1}{2}h + 3\)
   (f) \(\frac{1}{\sqrt{x + h} + \sqrt{x}}\)
   (g) \(\frac{2x + h}{\sqrt{(x + h)^2 - 1} + \sqrt{x^2 - 1}}\)

2. (a) 0
   (b) -1
   (c) \(-\frac{4}{3}x - 2h\)
   (d) \(-2x - 3h - 4\)