

## Different quotient (and similar) practice problems

1. For each of the following functions, simplify the expression

$$\frac{f(x+h) - f(x)}{h}$$

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

$$\frac{f(x+h) - f(x+2h)}{h}$$

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)  $-2x - 3h - 4$