

## Exercise 7

Given  $f(x) = 2x^2 + 4x$  and  $g(x) = \frac{1}{2x}$ , find  $f + g$ ,  $f - g$ ,  $fg$ , and  $\frac{f}{g}$ . Determine the domain for each function in interval notation.

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### Solution

Determine each of the functions.

$$f + g = f(x) + g(x) = (2x^2 + 4x) + \left(\frac{1}{2x}\right) = 2x^2 + 4x + \frac{1}{2x}$$

$$f - g = f(x) - g(x) = (2x^2 + 4x) - \left(\frac{1}{2x}\right) = 2x^2 + 4x - \frac{1}{2x}$$

$$fg = f(x)g(x) = (2x^2 + 4x) \left(\frac{1}{2x}\right) = \frac{2x^2}{2x} + \frac{4x}{2x} = x + 2$$

$$\frac{f}{g} = \frac{f(x)}{g(x)} = \frac{2x^2 + 4x}{\frac{1}{2x}} = (2x^2 + 4x)(2x) = 4x^3 + 8x^2$$

In each formula  $2x$  appears in a denominator at some point, and since you can't divide by zero,  $2x \neq 0$ . Divide both sides by 2:  $x \neq 0$ . Therefore, the domain of  $f + g$ ,  $f - g$ ,  $fg$ , and  $f/g$  is  $(-\infty, 0) \cup (0, \infty)$ .