

Complete as many of the following problems as you can. You do not have to go in order.

**Note: This classwork is optional**

(1) If  $f(x) = x^2 + 2x - 1$  and  $g(x) = 2x - 3$ , find the following:

(a)  $f \circ g$

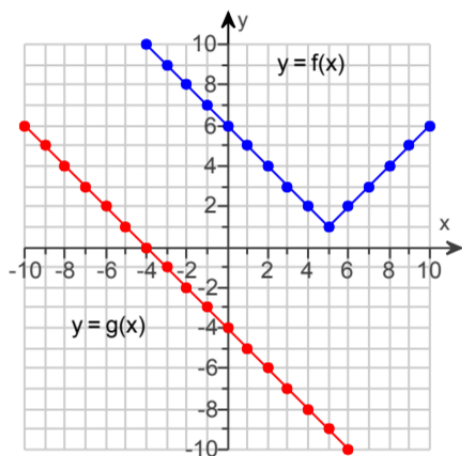
(b)  $g \circ f$

(2) Find  $f + g$ ,  $f - g$ ,  $fg$  and  $\frac{f}{g}$  for each pairs of functions.

(a)  $f(x) = 3x^2 + 1$ ,  $g(x) = x + 3$

(b)  $f(x) = x^2 + 13x + 42$ ,  $g(x) = x + 6$

(3) Consider the following graph of  $f$  and  $g$ .



(a) Find  $(f \circ g)(0)$

(c) Find  $(g \circ f)(3)$

(e) Find  $(f \circ f)(0)$

(b) Find  $(f \circ g)(-6)$

(d) Find  $(g \circ f)(6)$

(4) Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ . What is  $(f \circ g)(3)$  and  $(g \circ f)(3)$ ?

(a)  $f(x) = 2x$ ,  $g(x) = x - 3$

(b)  $f(x) = \frac{4}{x+3}$ ,  $g(x) = \frac{1}{x}$

(5) Find two (non-identity) functions  $f$  and  $g$  such that  $h(x) = (f \circ g)(x)$ , where

(a)  $h(x) = (2x - 1)^8$

(d)  $h(x) = \frac{1}{2x - 3} + 1$

(b)  $h(x) = \sqrt[3]{3x - 4}$

(c)  $h(x) = \sqrt{3x^3 - 4x + 7}$

(e)  $h(x) = |4x + 5|$

Key:

- (1) (a)  $4x^2 - 8x + 2$   
(b)  $2x^2 + 4x - 5$
- (2) (a)  $(f + g)(x) = 2x^2 + x + 4,$   
 $(f - g)(x) = 3x^2 - x - 2$   
 $(fg)(x) = 2x^3 + 9x^2 + x + 3,$   
 $\left(\frac{f}{g}\right)(x) = \frac{3x^2 + 1}{x + 3}$   
(b)  $(f + g)(x) = x^2 + 14x + 48,$   
 $(f - g)(x) = x^2 + 12x + 36,$   
 $(fg)(x) = x^3 + 19x^2 + 120x + 252,$   
 $\left(\frac{f}{g}\right)(x) = x + 7, x \neq 6$
- (3) (a) 10  
(b) 4  
(c) -7
- (d) -6  
(e) 2
- (4) (a)  $(f \circ g)(x) = 4x + 20, (g \circ f)(x) = 4x + 5,$   
 $(f \circ g)(3) = 32, (g \circ f)(3) = 17$   
(b)  $(f \circ g)(x) = \frac{4x}{1 + 3x}, (g \circ f)(x) = \frac{x + 3}{4},$   
 $(f \circ g)(3) = \frac{12}{7}, (g \circ f)(3) = \frac{3}{2}$
- (5) (a)  $g(x) = 2x - 1, f(x) = x^8$   
(b)  $g(x) = 3x - 4, f(x) = \sqrt[3]{x}$   
(c)  $g(x) = 3x^3 - 4x + 7, g(x) = \sqrt{x}$   
(d)  $g(x) = 2x - 3, f(x) = \frac{1}{x} + 2$   
(e)  $g(x) = 4x + 5, f(x) = |x|$