Assignment

1. Consider the functions $f(x) = 3x + 7$ and $g(x) = 2x - 4$, defined for all real numbers.

a) Determine the following functions in simplest form and state the domain and range of each function.

i) $(f + g)(x)$

$= (3x+7)+(2x-4)$

$= 5x+3$

ii) $(f - g)(x)$

$= 3x+7-(2x-4)$

$= 3x+7-2x+4$

$= x+11$

iii) $(g - f)(x)$

$= 2x-4-(3x+7)$

$= 2x-4-3x-7$

$= -x-11$

b) Evaluate

i) $(f + g)(5)$

$= 5(5)+3$

$= 28$

ii) $(f - g)(-3)$

$= (-3)+11$

$= 8$

iii) $(g - f)(0)$

$-0-11$

$= -11$

2. If $P(x) = x^2 - 7x + 3$ and $Q(x) = 2x + 9$, evaluate $(P - Q)(-3)$ in two different ways.

$(P-Q)(x) = x^2-7x+3-(2x+9)$

$= x^2-9x-6$

$(P-Q)(-3)$

$= (-3)^2-9(-3)-6$

$= \underline{30}$

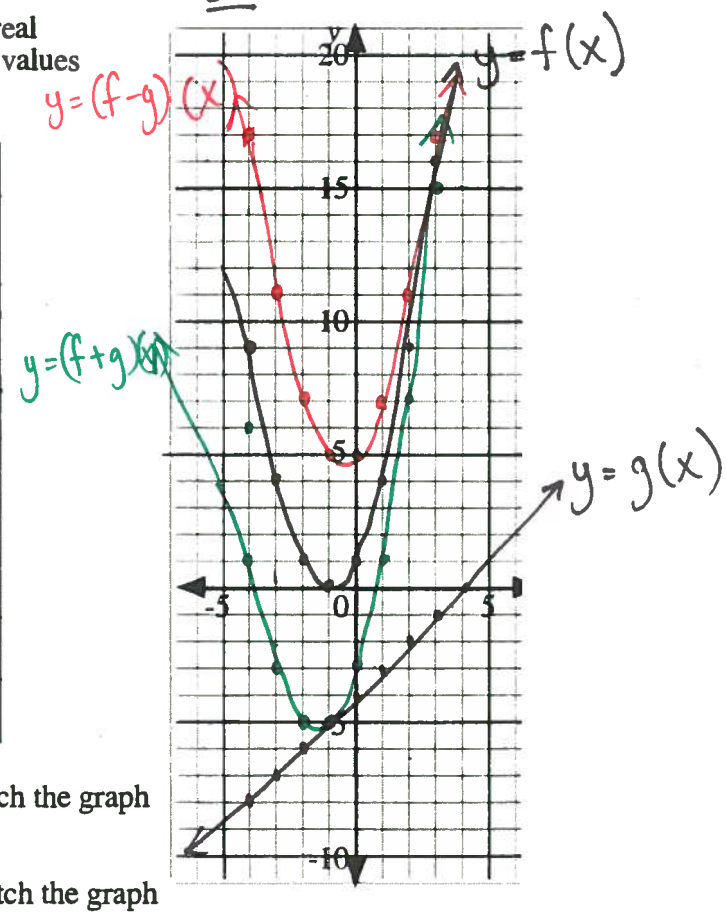
$P(-3) - Q(-3)$

$= [(-3)^2-7(-3)+3]-[2(-3)+9]$

$= \underline{30}$

3. Two functions $f(x)$ and $g(x)$ are defined for all real numbers. The table of values below shows the values of f and g for certain values of x.

x	$f(x)$	$g(x)$	$(f+g)(x)$	$(f-g)(x)$
–4	9	–8	1	17
–3	4	–7	–3	11
–2	1	–6	–5	7
–1	0	–5	–5	5
0	1	–4	–3	5
1	4	–3	1	7
2	9	–2	7	11
3	16	–1	15	17
4	25	0	25	25



a) Plot the points $(x, f(x))$ on the grid and sketch the graph of $y = f(x)$ for $x \in R$. ✓

b) Plot the points $(x, g(x))$ on the grid and sketch the graph of $y = g(x)$ for $x \in R$. ✓

c) Complete the tables above for $(f + g)(x)$ and $(f - g)(x)$ and sketch the graphs of $y = (f + g)(x)$ and $y = (f - g)(x)$ for $x \in R$.

d) The functions f and g on the previous page are $f(x) = x^2 + 2x + 1$ and $g(x) = x - 4$. Write expressions for the functions $(f + g)(x)$ and $(f - g)(x)$.

$(f+g)(x) = x^2+2x+1+(x-4)$
$= x^2+3x-3$

$(f-g)(x) = x^2+2x+1-(x-4)$
$= x^2+x+5$

e) Use a graphing calculator to graph the functions $y = (f + g)(x)$ and $y = (f - g)(x)$ from part d) and compare these graphs with the graphs from part c).

f) State the domains of the functions $(f + g)(x)$ and $(f - g)(x)$.

$x \in R$.

g) Determine the values of $(f + g)(8)$ and $y = (f - g)(-12)$.

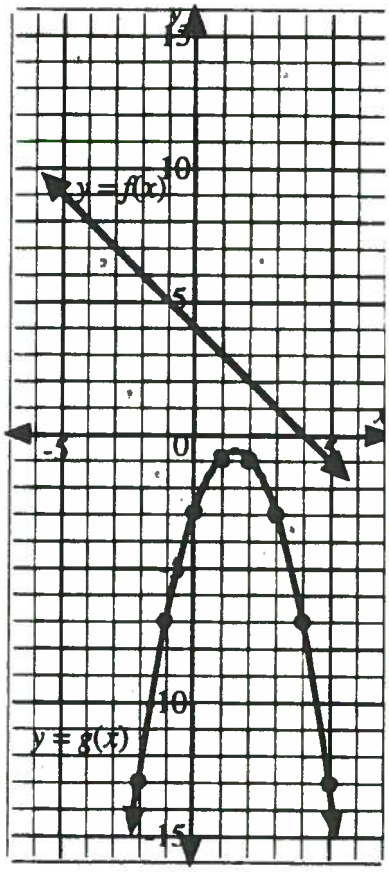
$(f+g)(8) = 8^2+3(8)-3$
$= 85$

$(f-g)(-12) = (-12)^2+(-12)+5$
$= 137$

h) In this example, the sum and difference of a linear function and a quadratic function are quadratic functions. Can you find a linear function and a quadratic function whose sum or difference is not a quadratic function?

No.

4. The graphs of two quadratic functions, $y = f(x)$ and $y = g(x)$, $x \in R$, are shown on the grid.



a) Use these graphs to sketch the graphs of $y = (f + g)(x)$ and $y = (f - g)(x)$ for $x \in R$.

b) The functions f and g above are $f(x) = 4 - x$ and $g(x) = -x^2 + 3x - 3$. Write expressions for the functions $(f + g)(x)$ and $(f - g)(x)$.

$(f+g)(x) = 4-x+(-x^2+3x-3)$
$= -x^2+2x+1$

$(f-g)(x) = 4-x-(-x^2+3x-3)$
$= x^2-4x+7.$

c) Use a graphing calculator to graph the functions $y = (f + g)(x)$ and $y = (f - g)(x)$ from part b) and compare these graphs with the graphs from part a).

d) State the domains of the functions $(f + g)(x)$ and $(f - g)(x)$.

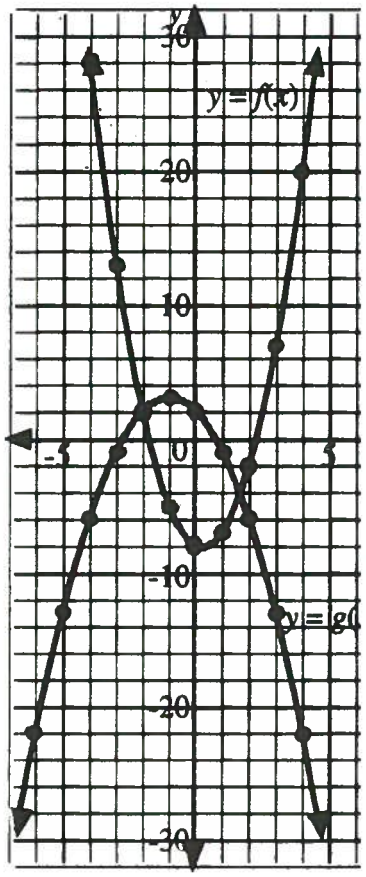
$x \in R$.

e) Evaluate. i) $(f + g)(-10)$ ii) $(f - g)(\sqrt{3})$

$(f+g)(-10) = -(-10)^2+2(-10)+1$
$= -119$

$(f-g)(\sqrt{3}) = (\sqrt{3})^2-4(\sqrt{3})+7$
$= 10-4\sqrt{3}$

5. The graphs of two quadratic functions, $y = f(x)$ and $y = g(x)$, $x \in R$, are shown on the grid.



a) Use these graphs to sketch the graphs of $y = (f - g)(x)$ and $y = (g - f)(x)$ for $x \in R$.

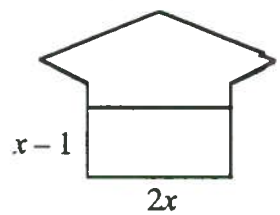
b) How do the graphs of $y = (f - g)(x)$ and $y = (g - f)(x)$ relate to each other?

c) The functions f and g above are $f(x) = 2x^2 - x - 8$ and $g(x) = -x^2 - 2x + 2$. Write expressions for the functions $(f - g)(x)$ and $(g - f)(x)$.

d) Use a graphing calculator to graph the functions $y = (f - g)(x)$ and $y = (g - f)(x)$ from part c) and compare these graphs with the graphs from part a).

e) Evaluate. i) $(f - g)\left(\frac{1}{2}\right)$ ii) $(g - f)\left(2\sqrt{2}\right)$

6. The figure shown has an area $A(x) = 2x^2 + 8x - 3$ cm^2.



a) Write an expression for the area, $B(x)$, of the bottom rectangular part of the figure.

$B(x) = 2x(x-1)$

$= 2x^2 - 2x$ cm^2.

b) Find an expression in simplest form for the area, $T(x)$, of the top part of the figure.

$T(x) = A(x) - B(x)$

$= 2x^2 + 8x - 3 - (2x^2 - 2x)$ $= 10x - 3$cm^2.

$= 2x^2 + 8x - 3 - 2x^2 + 2x$

c) If the area of the top is 9 cm^2, determine the value of x.

$10x - 3 = 9$

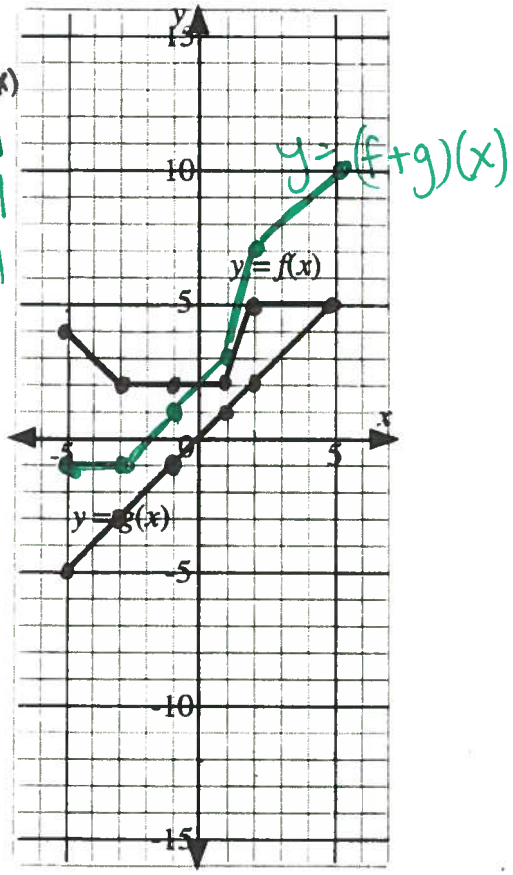
$10x = 12$

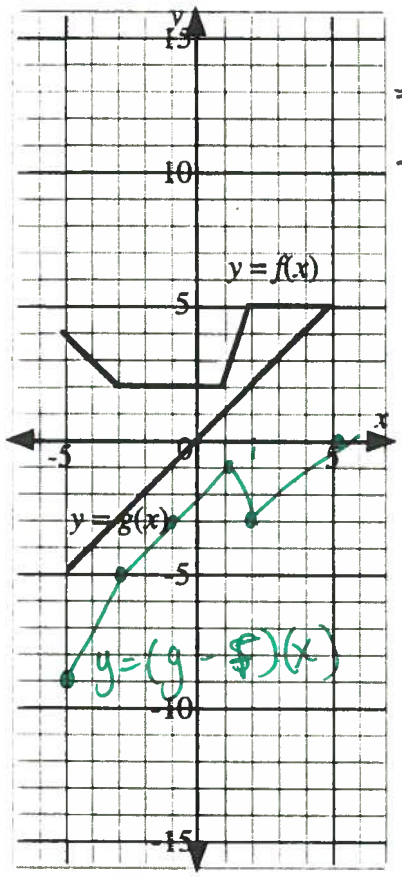
$x = \frac{6}{5}$

7. Partial graphs of functions f and g are shown on the grids.
In each case, sketch the graph of the indicated function.

a) $(f+g)(x)$ **b)** $(g-f)(x)$

x	f(x)	g(x)	(f+g)(x)
-5	4	-5	-1
-3	2	-3	-1
-1	2	-1	+1
1	2	1	3
2	5	2	7
5	5	5	10





x	f(x)	g(x)	g-f (x)
-5	4	-5	-9
-3	2	-3	-5
-1	2	-1	-3
1	2	1	-1
2	5	2	-3
5	5	5	0

Multiple Choice 8. The graph of $y = f(x)$ includes the points (2, 5), (4, 15), (7, 30).
The graph of $y = g(x)$ includes the points (2, 6), (3, 16), (4, 30).

If f and g are defined for all real values of x, then which of the following points **must** lie on the graph of $y = (f - g)(x)$?

A. (0, –1) **B.** (0, 1)

C. (2, –1) **D.** (3, 30)

(2, 5)
(2, 6)
5 - 6 = -1
(2, -1)

Numerical Response 9. If $f(x) = \sqrt{3x} - 2$ and $g(x) = 5\sqrt{3x}$, then $2(g - f)(3)$, to the nearest tenth, is _____ .

(Record your answer in the numerical response box from left to right.)

2	8		

$2(g-f)(x) = 2(5\sqrt{3x} - (\sqrt{3x} - 2))$
$= 2(4\sqrt{3x} + 2)$
$= 8\sqrt{3x} + 4$

$2(g-f)(3) = 8\sqrt{3x} + 4$
$= 8\sqrt{3 \cdot 3} + 4$
$= 8(3) + 4$
$= 28$