Consider the functions $f(x) = 3\sqrt{x} - 2$ and $g(x) = \sqrt{x} - 5$.

a) Write an expression in simplest form for each of the following functions.

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

b) Evaluate

i) $(f - g)(16)$ ii) $(fg)(49)$

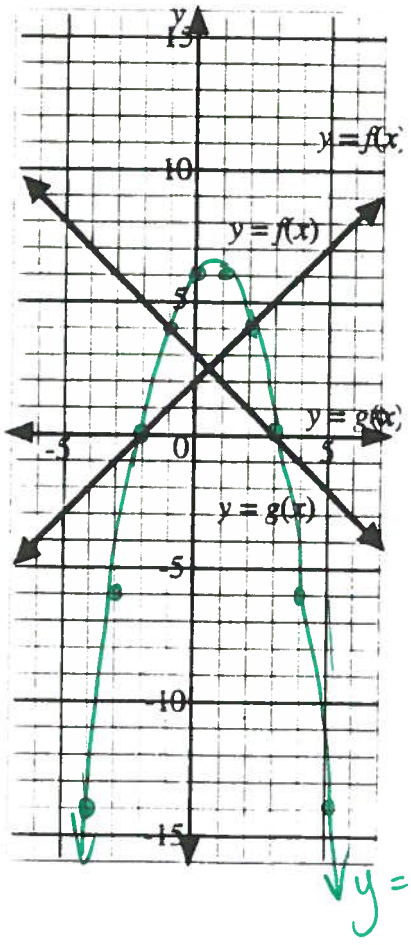
Complete Assignment Questions #1 - #6

Assignment

1. Consider functions f and g defined for all real numbers. Partial graphs of the functions are shown on the grid. Both functions have integer values when x is an integer.

a) Complete the table above for $(fg)(x)$.

x	$f(x)$	$g(x)$	$(fg)(x)$
−4	-2	7	-14
−3	-1	6	-6
−2	0	5	0
−1	1	4	4
0	2	3	6
1	3	2	6
2	4	1	4
3	5	0	0
4	6	-1	-6
5	7	-2	-14



b) Plot the points from the table which will fit on the grid and complete the sketch of $y = (fg)(x)$ for $x \in R$.

c) The functions f and g above are $f(x) = 2 + x$ and $g(x) = 3 - x$.
Write a simplified expression for the function $(fg)(x)$.

$(fg)(x) = (2+x)(3-x)$
$= 6 - 2x + 3x - x^2$ $= -x^2 + x + 6$

d) Use a graphing calculator to graph the function $y = (fg)(x)$ from part c) and compare this graph with the graph from part b).

e) Determine the domain and range of the function $(fg)(x)$.

$x \in R$, $y \mid y \leq \frac{25}{4}$, $y \in R$.

f) Calculate the value of $(fg)\left(-\frac{1}{2}\right)$ in two different ways.

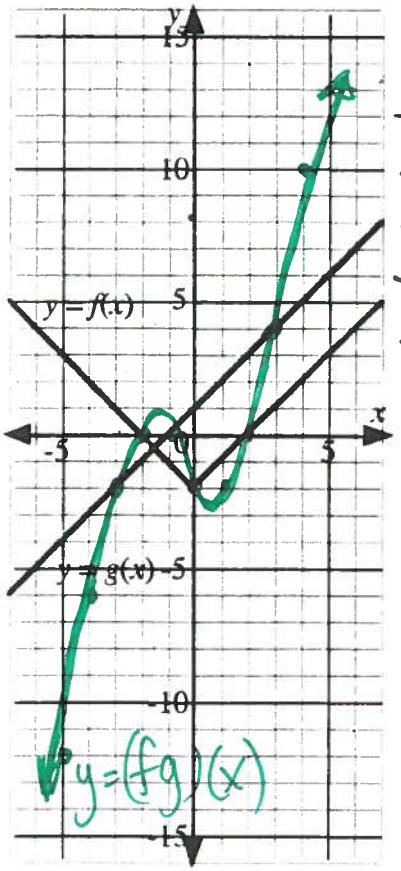
$(fg)(-\frac{1}{2}) = f(-\frac{1}{2})g(-\frac{1}{2}) = (\frac{3}{2})(\frac{7}{2})$
$= [2 + \frac{-1}{2}][3 - \frac{-1}{2}] = \frac{21}{4}$

$(fg)(-\frac{1}{2}) = 6 - (-\frac{1}{2})^2 + (-\frac{1}{2}) + 6$
$= -\frac{1}{4} - \frac{1}{2} + 6$
$= \frac{21}{4}$

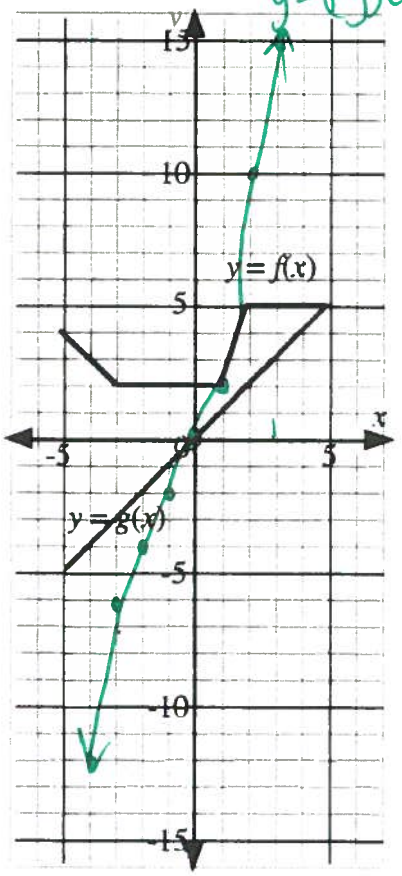
g) How does the graph of $(gf)(x)$ compare to the graph of $(fg)(x)$?

$fg = gf$ the graphs are identical.

2. Partial graphs of functions f and g are shown on the grids. In each case, sketch the partial graph of the function that is the product of these two functions.

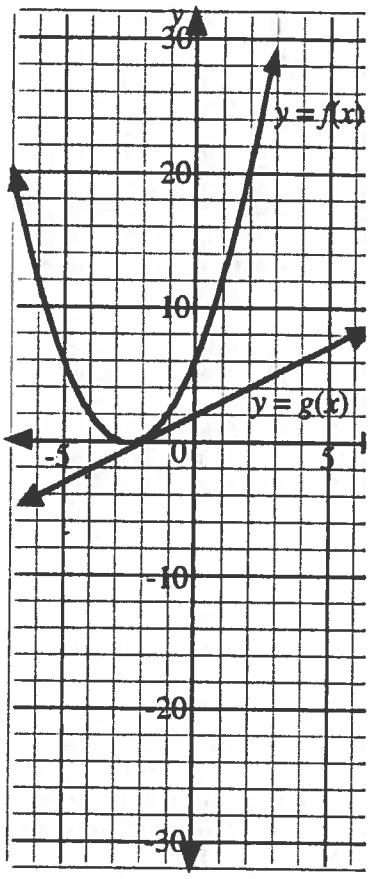


x	(fg)(x)
-5	-12
-4	-6
-3	-2
-2	0
-1	0
0	-2
1	-2
2	0
3	4
4	10
5	18



x	(fg)(x)
-4	-12
-3	-6
-2	-4
-1	-2
0	0
1	2
2	10
3	15

3. Consider functions f and g defined for all real numbers. Partial graphs of the functions are shown on the grid.



a) Complete the table using the values from the grid.

x	$f(x)$	$g(x)$	$(f+g)(x)$	$(fg)(x)$
−6	12	−4	8	−48
−5	6	−3	3	−18
−4	2	−2	0	−4
−3	0	−1	−1	−1
−2	0	0	0	0
−1	2	1	3	2
0	6	2	8	12
1	12	3	15	36
2	20	4	24	80

b) Plot the points from the table which will fit on the grid and sketch the graphs of $y = (f+g)(x)$ and $y = (fg)(x)$.

c) The functions f and g above are $f(x) = (x+3)(x+2)$ and $g(x) = x+2$.

i) Write an expression for the function $(f+g)(x)$ in expanded form.

$f(x) = (x+3)(x+2)$ $\quad (f+g)(x) = x^2+5x+6+(x+2)$

$= x^2+5x+6$ $\quad = x^2+6x+8$

ii) Write an expression for the function $(fg)(x)$ in expanded form.

$(fg)(x) = (x^2+5x+6)(x+2)$

$= x^3+5x^2+6x+2x^2+10x+12$

$= x^3+7x^2+16x+12.$

d) Use a graphing calculator to graph the functions from part c) and verify the sketches fro part b).

e) Complete the statement.

"In this question the product of a linear function and a quadratic function is a cubic function."

f) Can you find two functions, one whose graph is a straight line, and one whose graph is a parabola, such that the graph of the product of the two functions is not the graph of a cubic function?

$f(x) = 2$ $\quad (fg)(x) = 2x^2$

$g(x) = x^2$ $\quad$ not cubic

$(g-f)(x) = (-f+g)(x) = -(f-g)$

4. Consider the functions $f(x) = 2\sqrt{x} - 5$ and $g(x) = \sqrt{x} - 5$.

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

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

$= (2\sqrt{x} - 5) + (\sqrt{x} - 5)$

$= 3\sqrt{x} - 10$

$x \mid x \geq 0, \in R.$

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

$= (\sqrt{x} - 5) - (2\sqrt{x} - 5)$

$= -\sqrt{x}$

$x \mid x \geq 0, \in R.$

iii) $(gf)(x)$

$= (\sqrt{x} - 5)(2\sqrt{x} - 5)$

$= 2x - 5\sqrt{x} - 10\sqrt{x} + 25$

$= 2x - 15\sqrt{x} + 25$

$x \mid x \geq 0, \in R.$

b) Evaluate.

i) $(g+f)(4) = (f+g)(4)$

$= 3\sqrt{4} - 10$

$= 6 - 10$

$= -4$

ii) $(f-g)(49) = -(g-f)(49)$

$= -(g-f)(49)$

$= -(-\sqrt{49})$

$= -(-7)$

$= 7$

iii) $(fg)(0.25) = (gf)(x)$

$= 2(0.25) - 15\sqrt{0.25} + 25$

$= 0.5 - 15(0.5) + 25$

$= 18$

Multiple Choice **5.** The points $(4, 1), (7, 4), (9, 6)$ lie on the graph of $y = P(x), x \in R$.
The points $(4, 3), (7, 6), (9, 8)$ lie on the graph of $y = Q(x), x \in R$.
Which of the following points **must** lie on the graph of $y = (PQ)(x)$?

x-coor. stays same.

A. $(4, 3)$
B. $(16, 3)$
C. $(49, 24)$
D. $(63, 6)$

$4,1$
$4,3 \rightarrow 4,3$

$9,6$
$9,8 \rightarrow 9,48.$

$7,4$
$7,6 \rightarrow 7,24.$

Numerical Response **6.** Consider the functions $f(x) = 6 - 3x$ and $g(x) = 5 - 2x$. If the function $(fg)(x)$ is written in the form $ax^2 + bx + c$, then the value of $a - b + c$ is _____.

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

5	3		

$(fg)(x) = (6-3x)(5-2x)$

$= 30 - 12x - 15x + 6x^2$

$= 6x^2 - 17x + 30$

$a = 6$
$b = -17$
$c = 30$

$a - b + c = 6 - (-17) + 30$

$= 6 + 17 + 30$

$= 53$