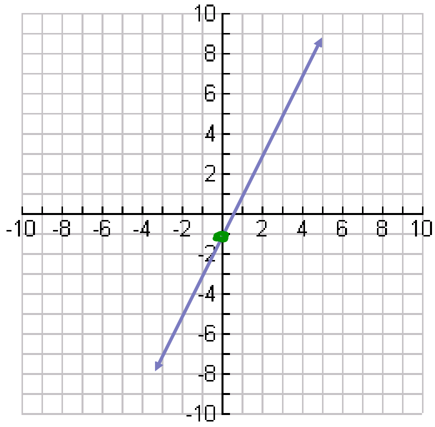
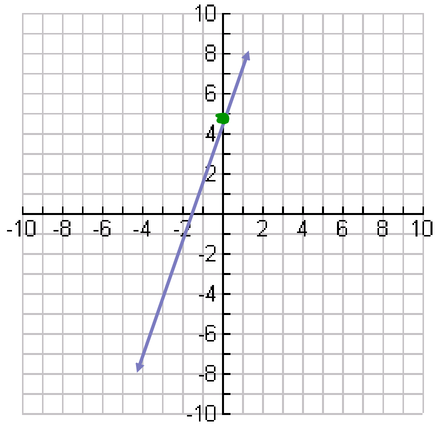
1.7 Operations with Functions

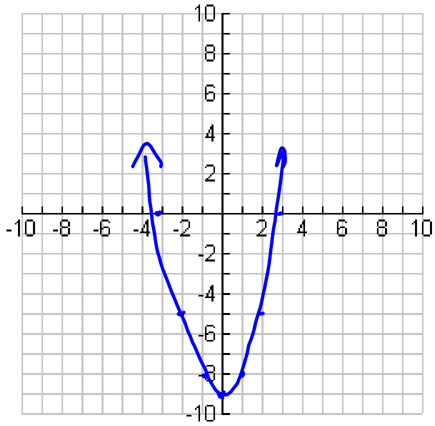
$f(x) = 2x - 1$



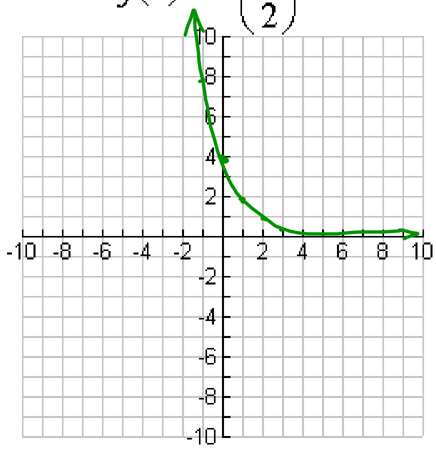
$g(x) = 3x + 5$



$h(x) = x^2 - 9$



$j(x) = 4\left(\frac{1}{2}\right)^x$



Using the tables of values and graphs of the original functions determine the graphs of each of the following "operational" functions:

(a) f(x) - g(x) $= f(0) - g(0) = -1 - 5 = -6 \quad \| \quad f(-3) - g(-3) = -7 - (-4) = -3$

(b) g(x)h(x)

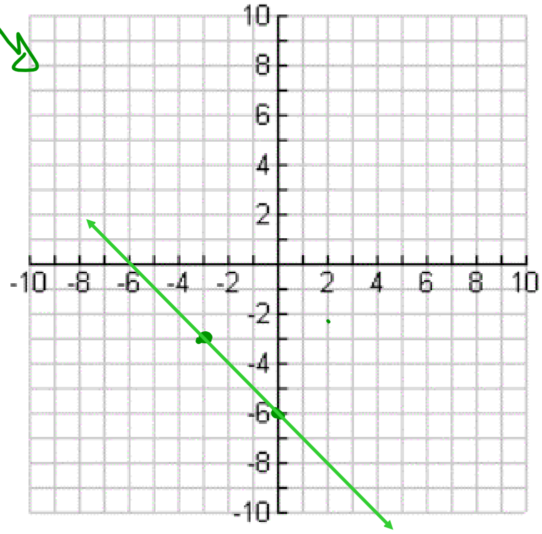
(c) h(x) + j(x)

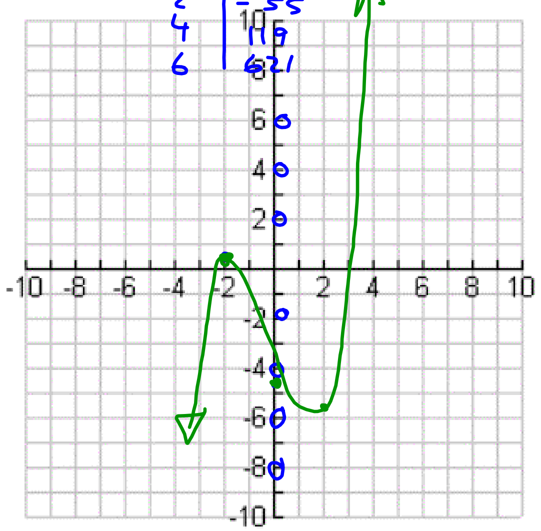
(d) f(x) j(x)

x	y
-4	-175
-2	5
0	-45
2	-55
4	119
6	621

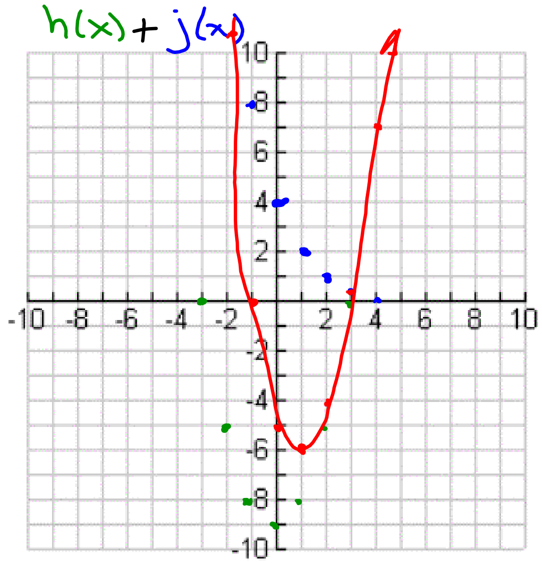
$g(x)h(x)$

$(3x+5)(x^2-9)$



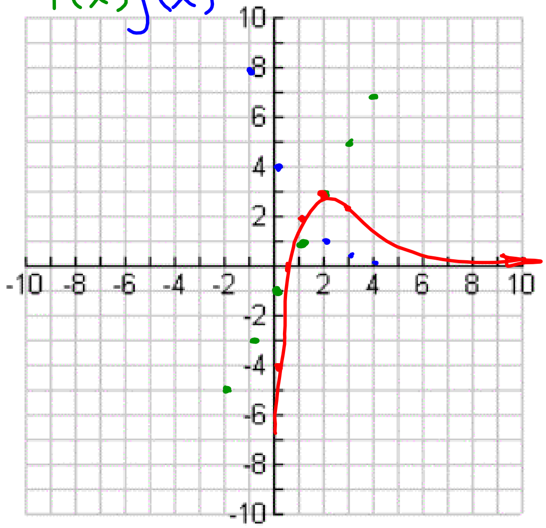


$h(x) + j(x)$



$2x-1$

$f(x)j(x)$ $4\left(\frac{1}{2}\right)^x$



Using the expressions of the original functions determine the expressions of each of the following "operational functions:

(a) $f(x) - g(x) = (2x-1)-(3x+5)$

$= -x-6$

(b) $g(x)h(x) = (3x+5)(x^2-9)$

$= 3x^3+5x^2-27x-45$

(c) $h(x) + j(x) = (x^2-9)+4\left(\frac{1}{2}\right)^x$

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

$= 8x\left(\frac{1}{2}\right)^x - 4\left(\frac{1}{2}\right)^x$

or $= 4\left(\frac{1}{2}\right)^x\left[2x-1\right]$

(e) $f(x) + g(x)$

$= (2x-1)+(3x+5)$

$= 5x+4$

always Never

Statement	A, S or N?	Explanation or counter example
When two linear functions are added or subtracted together, the result is a linear function	Always	degree is unchanged
When two quadratic functions are added or subtracted together, the result is a quadratic function	A/S	*except $(x^2)-(x^2+5)$ $y=-5$
When two linear functions are multiplied together the result is a quadratic function	A/S	* except 2 horizontal lines
The x-intercepts of each linear function p(x) and q(x) becomes the x-intercepts of the new addition function p(x) + q(x)	N/S	* unless they have the same x-int.
Two functions can be added together if they share the same domain	A	
The x-intercepts of the original functions p(x) and q(x) become the x-intercepts of the new product function p(x)q(x)	A	
If p(x) and q(x) are of the same type, then their sum or ~~addition~~ difference will be of the same type.	A/S	*if p & q are x-axis reflections of one another

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