Unit 5: Operations on Functions and their characteristics

- operations on functions
- Recall characteristics of functions
- distance

$f(x) = -2$

$g(x) = 1x^2 + 2$

$g(x) = a(x-h)^2 + k$

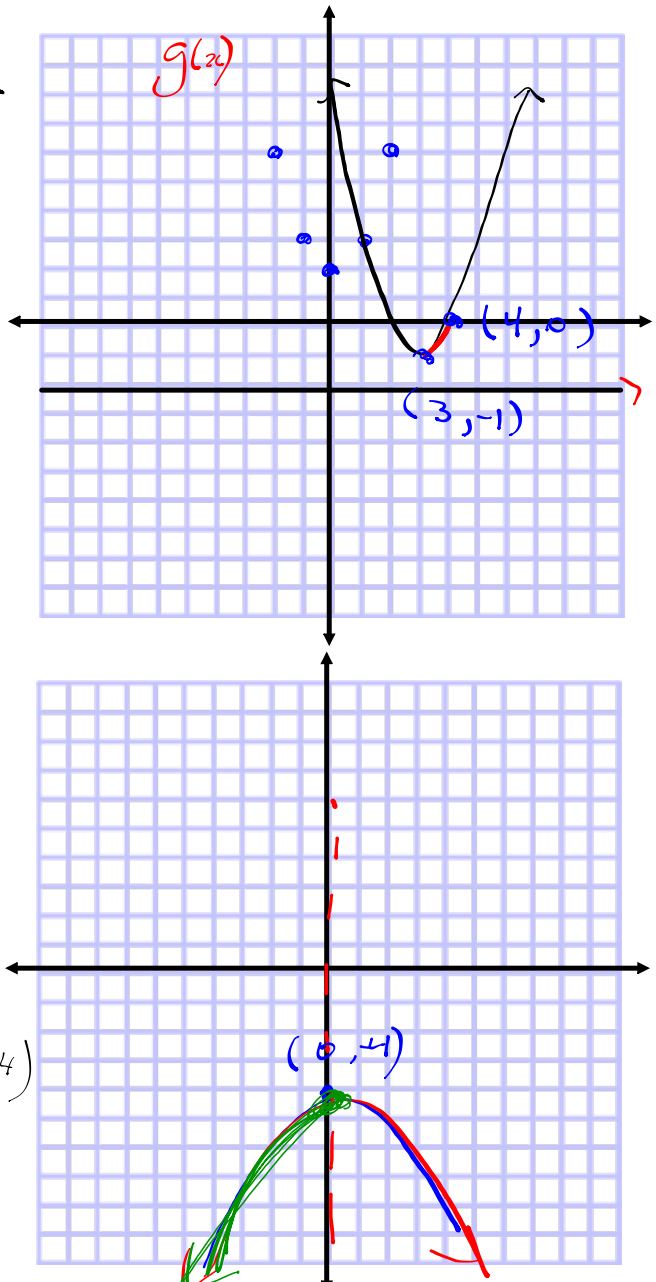
$g(x) = a(x-0)^2 + 2$

sub in $(-1, 3)$

$3 = a(-1)^2 + 2$

$1 = a1$

$a = 1$



Find $(f \cdot g)(x) = f(x) \cdot g(x)$

$= -2 \cdot (x^2 + 2)$

$(f \cdot g)(x) = -2x^2 - 4$

$ax^2 + bx + c$

$a = -2$

$b = 0$

$c = -4$

$\Delta = b^2 - 4ac$

$\Delta = 0^2 - 4(-2)(-4)$

$\Delta = -32$

$V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$

$V\left(0, \frac{-(-32)}{4(-2)}\right)$ $V(0, -4)$

Domain: $]-\infty, \infty[$

Range: $]-\infty, -4]$

Negative: $]-\infty, \infty[$

Positive: None

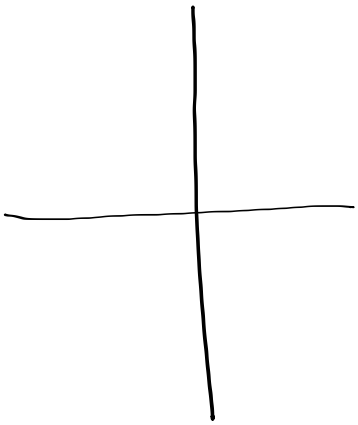
Increasing Interval $]-\infty, 0]$

Decreasing Interval: $[0, \infty[$

$f(x) = -2x^2 - 4$

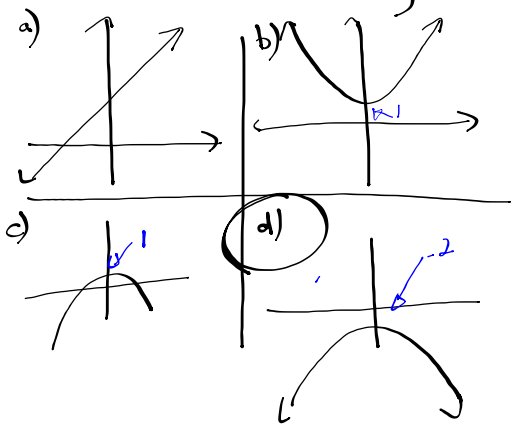
Range : $\_\_\_\_\_ \times$

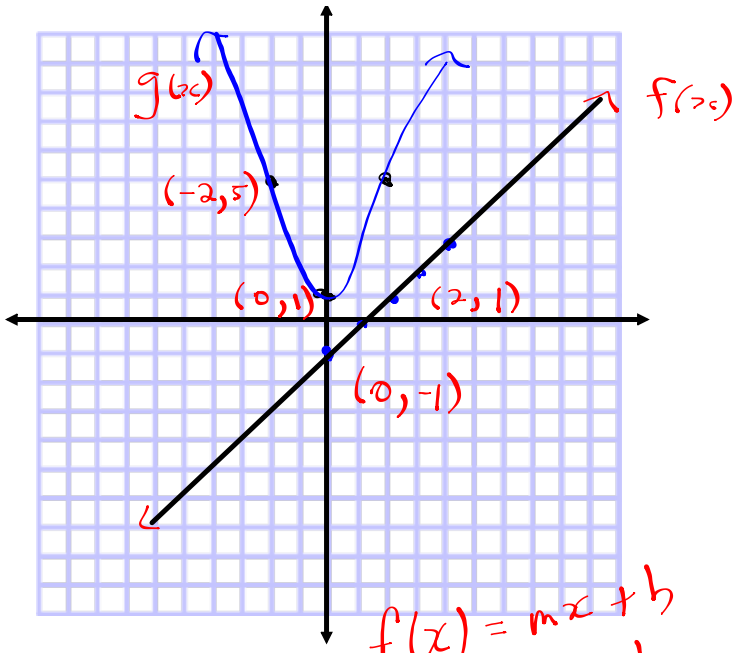
Positive : $\_\_\_\_\_ \times$



Exam Question:

Determine which of the following graphs best represents $f - g$





$f(x) = mx + b$

$f(x) = 1x - 1$

$g(x) = a(x-h)^2 + k$

$g(x) = a(x-0)^2 + 1$

$5 = a(-2-0)^2 + 1$

$\frac{4}{4} = \frac{a4}{4}$ $a = 1$

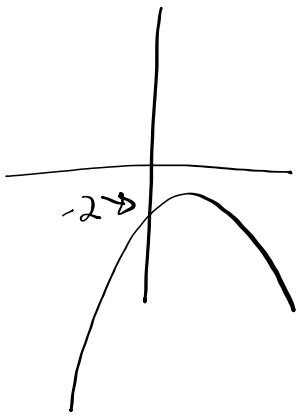
$g(x) = 1(x)^2 + 1$

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

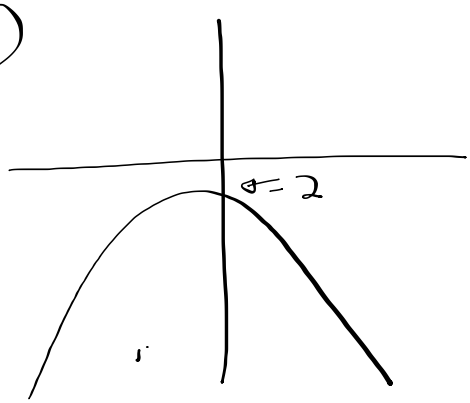
$= (x-1) - (x^2+1)$

$(f-g)(x) = -x^2 + x - 2$

a)



b)



If

$g(x) = ax^2$, where $a < 0$

$g(x) = -2x^2$ let $a = -2$

$h(x) = cx$, where $c < 0$

$h(x) = -x$ let $c = 1$

Determine which graph best represents $g - h$

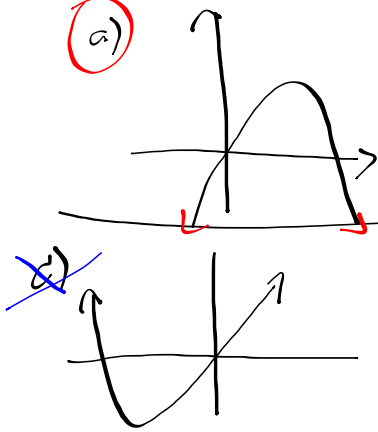
$= g(x) - h(x)$

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

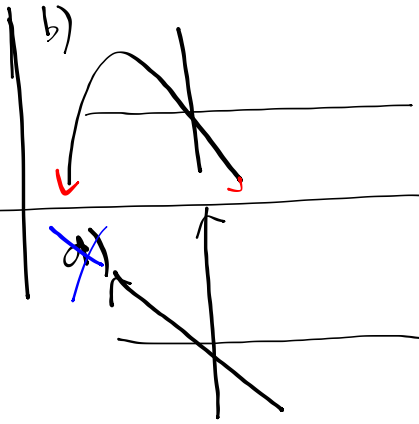
$f(x) = -2x^2 + x$

$ax^2 + bx + c$

a)



b)



c)

d)

$\Delta = b^2 - 4ac$

$\Delta = + \#$

$V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$

$V(-, -)$

$V(+, +)$

If $g(x) = ax^2$, $a > 0$

$g(x) = 3x^2$, $a = 3$

$h(x) = b$, $b > 0$

$h(x) = 2$, $b = 2$

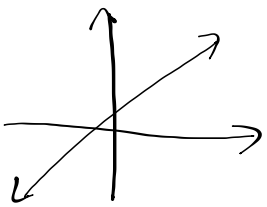
Which graph best represents $g - h$?

$g - h$

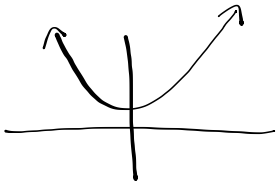
$= g(x) - h(x)$

$= 3x^2 - 2$

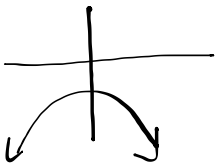
a)



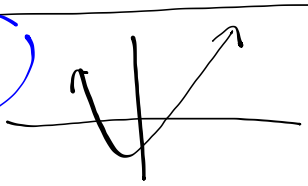
b)



c)



d)



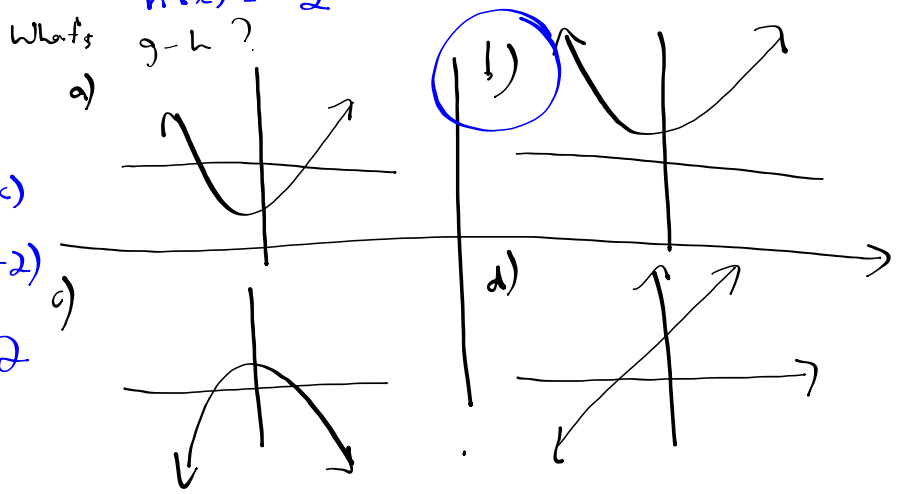
If $g(x) = a_1 x^2$, where $a_1 > 0$

$g(x) = 2x^2$ $a_1 = 2$

$h(x) = a_2$, where $a_2 = -a_1$

$h(x) = -2$ $a_2 = -2$

What's $g - h$?



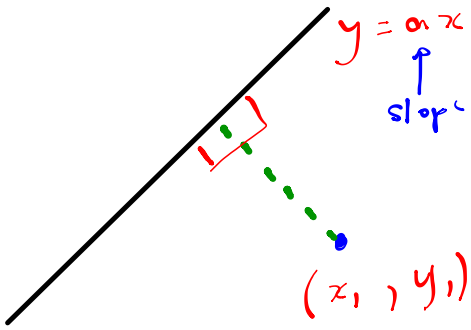
$g - h$

$= g(x) - h(x)$

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

$= 2x^2 + 2$

Unit 6: (Shortest) Distance Between a Point and a Line



$$d = \frac{|ax_1 - y_1 + b|}{\sqrt{a^2 + 1}}$$

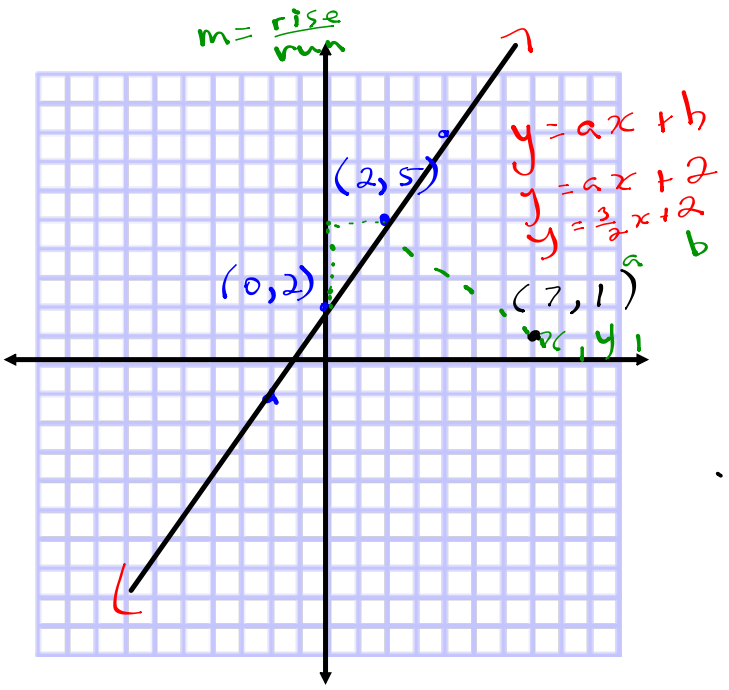
$2x + y + 3 = 0$

$y = -2x - 3$

| | → absolute value

$|-2| = 2$ (can't have a negative distance)

Question
Find the distance between the line and the point.

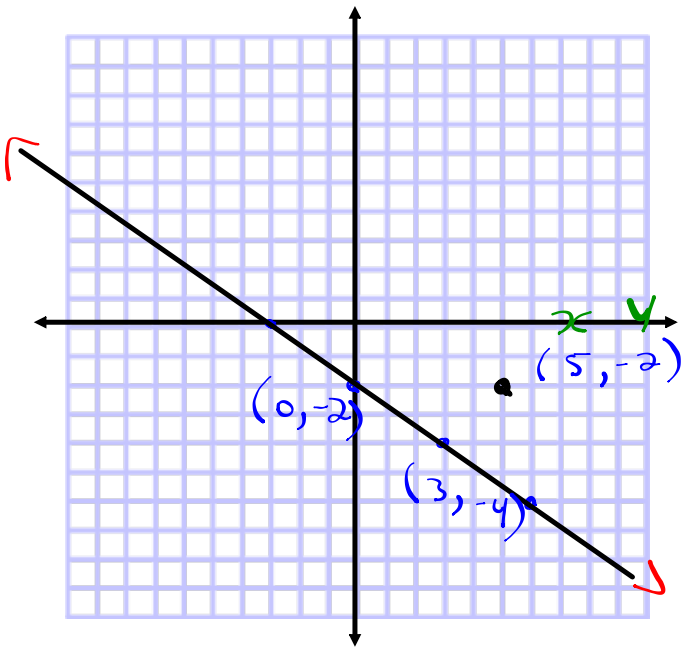


$$d = \frac{|ax_1 - y_1 + b|}{\sqrt{a^2 + 1}}$$

$$d = \frac{\left|\left(\frac{3}{2}(7) - (1) + 2\right)\right|}{\sqrt{\left(\frac{3}{2}\right)^2 + 1}}$$

$$d = \frac{|11.5|}{\sqrt{\left(\frac{3}{2}\right)^2 + 1}} = 6.379$$

Find the distance between the point and the line.



$y = \frac{-2}{3}x - 2$ (a, b)

$d = \frac{|ax_1 - y_1 + b|}{\sqrt{a^2 + 1}}$

$d = \frac{\left|\left(\frac{-2}{3}\right)5 - (-2) + (-2)\right|}{\sqrt{\left(\frac{-2}{3}\right)^2 + 1}} = \frac{\left|\frac{-10}{3}\right|}{\sqrt{\quad}} = \frac{\frac{10}{3}}{\sqrt{\quad}}$

$d = 2.77$ units

Lion

Question