Unit 3: Composition of a Function

if $f(x) = -2\sin x$

$g(x) = -x - 2$

$$\boxed{f \circ g(x) = f(g(x))}$$

find $f \circ g(x)$

$f \circ g(x) = f(-x-2)$

$f \circ g(x) = -2\sin(-x-2)$

$g \circ f(x) = g(f(x))$

$g \circ f(x) = g(-2\sin x)$

$= -(-2\sin x) - 2$

$= (2\sin x) - 2$

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$g(x) = \frac{1}{x}$

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

find $g \circ h(x)$

$h \circ g(x)$

2. b) $h \circ g(-2)$

$h \circ g(x) = h(g(x))$

$= h\left(\frac{1}{x}\right)$

$h \circ g(x) = \left(\frac{1}{x}\right)^2 + \frac{1}{x} + 1$

$h \circ g(-2) = \left(\frac{1}{-2}\right)^2 + \frac{1}{-2} + 1$

$h \circ g(-2) = \frac{3}{4}$

if $f(x) = -2\sin x$

$g(x) = -x - 2$

QI Do f and f o g have the same range? YES!

QII Do f and g o f have the same zeros? NO!

QIII Do f and f o g have the same min value? (w respect to the y) YES!

graph f o g and g o f and answer Q's

Recall : Graphing sin functions

$f(x) = -2\sin x$

$f(x) = a\sin b(x-h) + k$

$a = -2$ $h = 0$ Amp $= |-2| = 2$

$b = 1$ $k = 0$

Period $= \frac{2\pi}{1} = 2\cdot\pi$

· starting point for sin (h, k)

· starting point for cos $\boxed{(h, k+a)}$

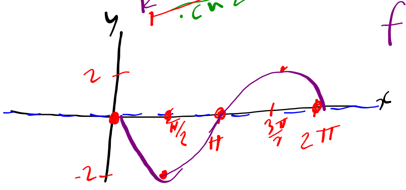
Centre Axis $y = 0$

$(0,0)$

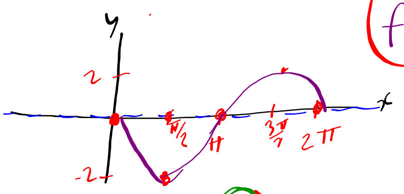
k / min / k / max / k

· cn2 $a \cdot b < 0$

f.



$f(x) = -2\sin x$



f.

$f \circ g(x) = -2\sin(-x-2)$

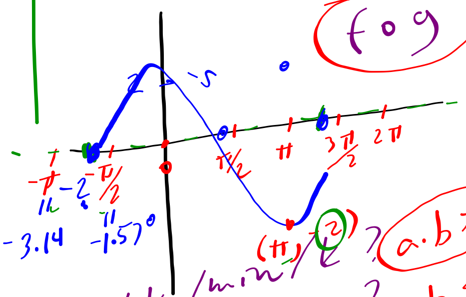
$y = a\sin b(x-h)+k$

$f \circ g(x) = -2\sin -(x+2)$

Amp = 2 $\qquad$ y = 0

Period = 2π $\qquad$ s.p(-2, 0)

f∘g



k/max/k/min/k ? $a \cdot b > 0$

k/max/k/min/k/max/k ? $a \cdot b < 0$

k/min/k/max/k

$g \circ f(x)$

$= 2\sin x - 2$

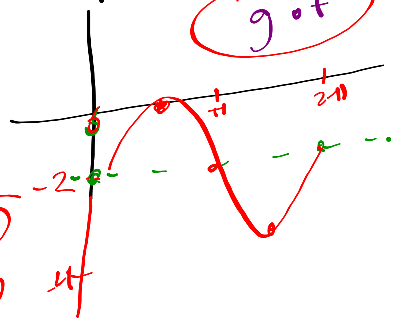
Amp = 2 $\qquad$ h, k

P = 2π $\qquad$ (0, -2)

y = -2

k/max/k/min/k

g∘f



sin	cos
s.p. (h, k)	s.p (h, k + a)
k / max / k / min / k	max / k / min / k / max
$a \cdot b > 0$	$a > 0$
k / min / k / max / k	min / k / max / k / min
$a \cdot b < 0$	$a < 0$

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if $t(x) = \log_3 x - 1$ find: $f \circ t(x)$

$f(x) = 5 - x$ find $t \circ f(4)$

Q I $f \circ t(x) = f(t(x))$

$= f(\log_3 x - 1)$

$= 5 - (\log_3 x - 1)$

$= 5 - \log_3 x + 1$

$f \circ t(x) = -\log_3 x + 6$

$t \circ f(x) = t(f(x))$

$= t(5 - x)$

$t \circ f(x) = \log_3 (5 - x) - 1$

$t \circ f(4) = \log_3 (5 - 4) - 1$

$= \log_3 1 - 1$

$= \frac{\log 1}{\log 3} - 1$

$= -1$

if $t(x) = \log_3 x - 1$

$f(x) = 5 - x$

$t \circ f(x) = \log_3 (5-x) - 1$

graph it

$t \circ f(x) = \log_3 (-x + 5) - 1$

$= \log_3 -1(x - 5) - 1$

$a = 1$ $\quad c = 3$ $\quad k\ -1$

$b = -1$ $\quad h = 5$

$\boxed{x = 5}$

QI. Is the domain of $t \circ f$ a subset of t?

Recall: graphing log f.

$t(x) = \log_3 x - 1$

$y = a \log_c b(x - h) + k$

$a = 1$ $\quad c = 3$ $\quad k = -1$

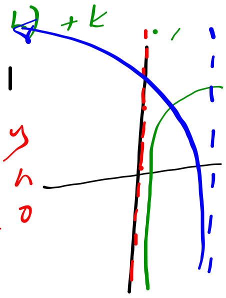
$b = 1$ $\quad h = 0$

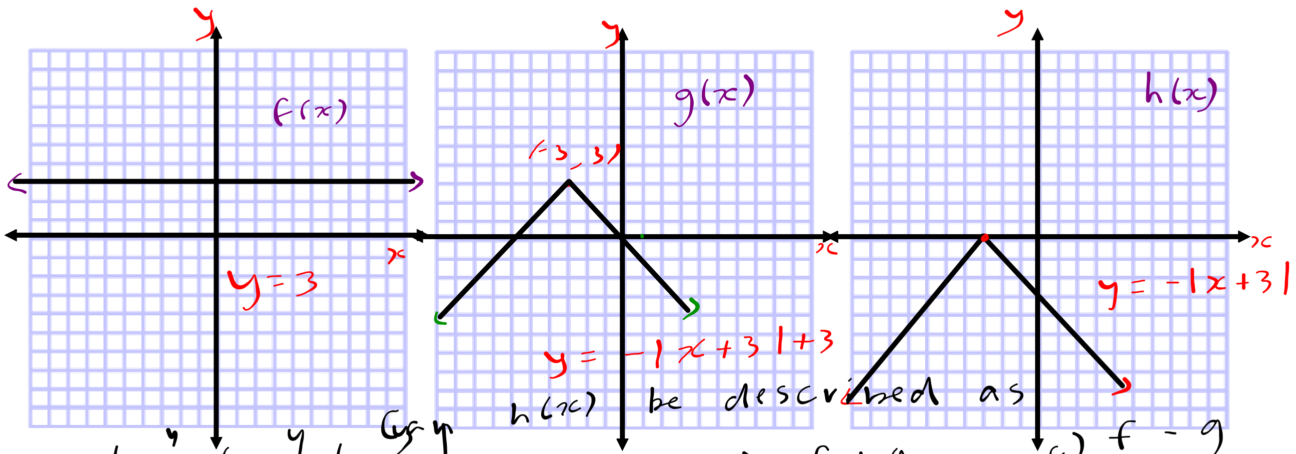
c does a's job

asy

$x = h$

$x = 0$





h(x) be described as

a) ~~f + g~~

b) ~~f · g~~

c) f - g

d) g - f

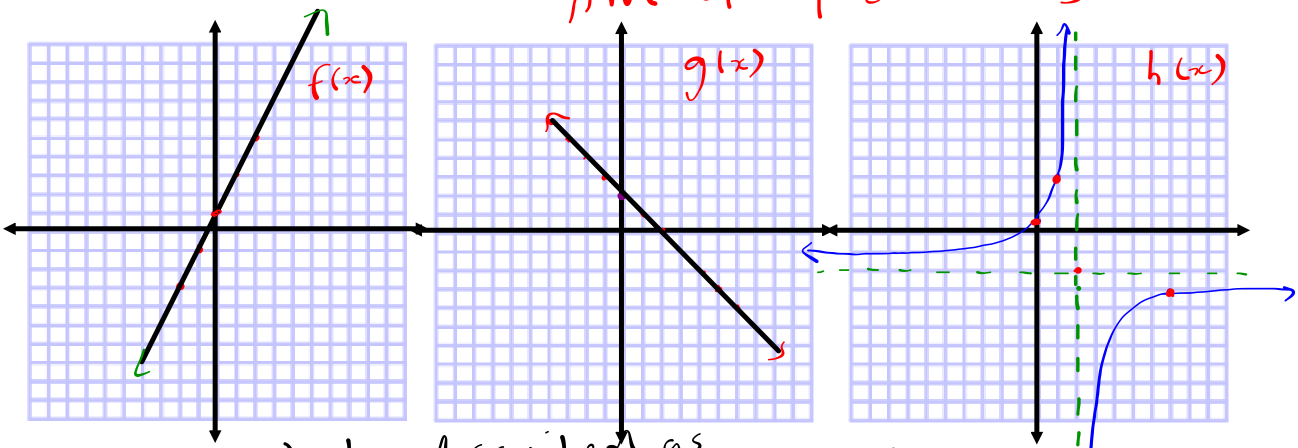
$g(x) - f(x)$

x	f(x)	g(x)	h(x)
0	3	0	-3
1	3	-1	-4

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

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

HMWK p 2.25 #5



Can $h(x)$ be described as

a) $f - g$

b) $f \div g$

c) $g - f$

d) $g \div f$

Unit 4: Solving 1st and 2nd degree inequalities

$x+2<0$ $\quad$ $x^2<4$

$\geq$ $\leq$

ex. Solve the following

$$2(2x-1)-(3x+4)\geq 4x+(1-x)$$

1st degree
- evaluate
- bring x's together
- isolate x

* when you divide or times both sides by a - you switch the inequality

$$4x-2-3x-4\geq 4x+1-x$$

$$x\ \cancel{-6}\ \color{green}{-3x}\ \color{red}{+6}\geq \cancel{3x}\ \color{green}{-3x}+1\ \color{red}{+6}$$

$$\frac{\cancel{-2}x}{\cancel{-2}}\geq\frac{7}{-2}$$

$$x\leq\frac{7}{-2}$$

Express final answer in:

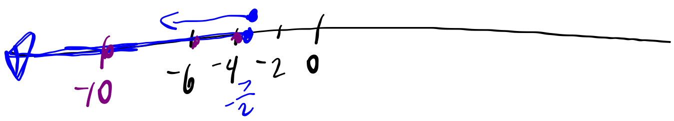
i. interval notation

$$\left(-\infty,-\frac{7}{2}\right]$$

ii set builder notation

ans: $\{x\in\mathbb{R}\mid x\leq\frac{7}{-2}\}$

iii. graph notation (number line)



p 4.8

#4

$$3x - 2(1 - x) + 4 \leq 5x + 3(2x + 3) \text{ in } \mathbb{N}$$

give final answer in set builder ~~no~~tation.

$$x \geq -\frac{7}{6}$$

Inequalities in the second degree

Solve

$$2x^2 + 5x - 3 \leq 0$$

$2 \times -3 = -6$

-6

$1 \; -6$ $\quad$ $-1 \; 6$

$2 \; -3$ $\quad$ $-2 \; 3$

$$2x^2 + 6x - x - 3 \leq 0$$

$$2x(x+3) - 1(x+3) \leq 0$$

$$(x+3)(2x-1) \leq 0$$

$$(x+3)(2x-1) = 0$$

$x + 3 = 0$ or $2x - 1 = 0$

$x_1 = -3$ $\qquad$ $2x = 1$

$\cancel{2}x = \frac{1}{2}$

$x_{11} = \frac{1}{2}$

step i: Factor or use quad formula

step ii: Find two solutions and put on number line

step iii sub in a test point (not a solution) into original inequality.

- True - shade where test is
- False - shade where test point is not

sub $x = 2$ into

$$2x^2 + 5x - 3 \leq 0$$

$$2(2)^2 + 5(2) - 3 \leq 0$$

$$8 + 10 - 3 \leq 0$$

$$15 \leq 0 \quad \text{False}$$

False $\qquad$ True $\qquad$ False

-3 -2 -1 0 1 2 3

(True $\qquad$ False $\qquad$ True)

Ans $\{-3, \frac{1}{2}\}$

$\{x \in \mathbb{R} \mid -3 \leq x \leq \frac{1}{2}\}$

Solve

Nota Bene, Nico says
<< Everything to one side first >>

$-2x^2 + 6x \leq -x + 3$

final answer in graph notation

Solve

$0 \leq x^2 - 4$

final answer interval notation

HMWK
p 4.27 - 4.29 (2nd)
p 4.34 - 4.35

HMWK p 2.25 #5

p 3.21,