Unit # 7 combining Functions

(Sum & Difference of Functions)

RULE: For the same x-value, add/subtract the y-values

Notation: we can write $f(x) \pm g(x)$ as $(f \pm g)(x)$

Examples!

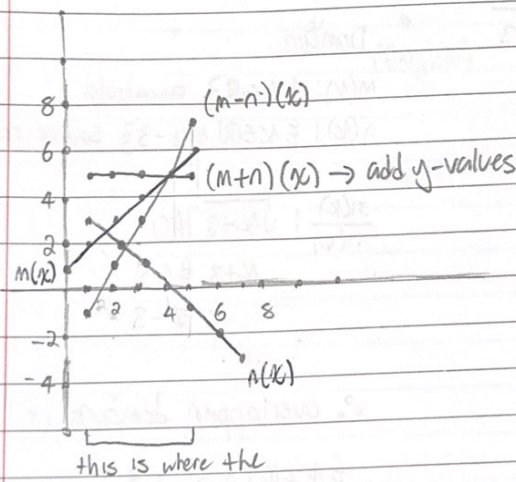
① Given $f(x) = \{(1,3), (2,-5), (3,7)\}$ and
$g(x) = \{(2,-2), (3,5), (4,1)\}$ find

* x-values of 2 and 3 are common in both f(x) and g(x)

a) $f(x)+g(x)$
$= \{(2,-7), (3,10)\}$

b) $(f-g)(x)$
$= \{(2,-3), (3,4)\}$

② Given m(x) and n(x) below, graph
a) $(m+n)(x)$ b) $(m-n)(x)$



this is where the x-values (domain) overlaps... so our combined function is here

Product & Quotient of Functions

RULE: For the same x-values, multiply / divide the y-values

Notation: $f(x) \times g(x)$ can be written as $(f \times g)(x)$

$f(x) \div g(x)$ can be written as $\frac{f(x)}{g(x)}$ or $(f \div g)(x)$

Examples:

① Given $f = \{(1,5), (2,0), (5,11)\}$ and $g = \{(2,-4), (3,1), (5,0)\}$ find

a) $(f \times g)(x)$
$= \{(2,0), (5,0)\}$

b) $(f \div g)(x)$
$= \{(2,0)\}$

c) $(g \div f)(x)$
$= \{(5,0)\}$

② Given $m(x) = x^2 + x - 6$ and $n(x) = \sqrt{x+3}$ determine $(m \div n)(x)$ fully simplified and determine its domain

$$(m \div n)(x) = (x^2 + x - 6) \div \sqrt{x+3}$$

$$= \frac{x^2 + x - 6}{\sqrt{x+3}}$$

$$= \frac{(x+3)(x-2)}{(x+3)^{\frac{1}{2}}}$$

$$= (x+3)^{\frac{1}{2}}(x-2)$$

$$= \sqrt{x+3}\,(x-2)$$

Domain

$m(x)$: $\{x \in \mathbb{R}\}$ parabola

$n(x)$: $\{x \in \mathbb{R} \mid x \geq -3\}$ square root function

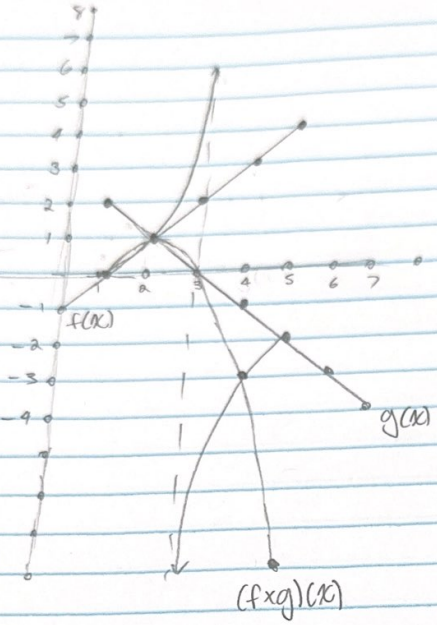
$\frac{m(x)}{n(x)}$: $\sqrt{x+3} \neq 0$

$x + 3 \neq 0$

$x \neq -3$

∴ overlapping domains is

$\{x \in \mathbb{R} \mid x > -3\}$



a) graph $(f \times g)(x)$

$(f \div g)(x)$

b) when is $\frac{f(x)}{g(x)} > 1$?

$x \in (2,3)$