9.3 and 9.4 Combining Two Functions: Products and Quotients

"I can multiply and divide functions. I know their main properties.
I can apply what I have learned in unfamiliar settings."

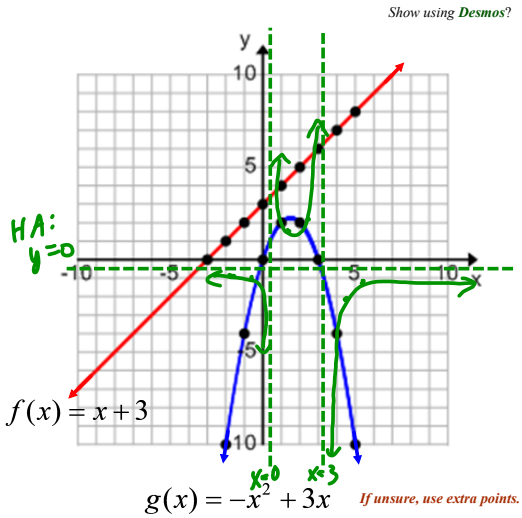
Given functions $f(x)$ and $g(x)$:
The **product of two functions** is $f(x) \cdot g(x)$ which can also be written as $(f \times g)(x)$.
The **quotient of two functions** is $f(x) \div g(x)$
which can also be written as $(f \div g)(x)$, where $g(x) \neq 0$.

Ex. 1:

Complete the table of values, then graph $(f \div g)(x)$

*Show using **Desmos**?*

x	$f(x)$	$g(x)$	$(f \times g)(x)$	$(f \div g)(x)$
-2	1	-10	-10	$\frac{-1}{10} = -0.1$
-1	2	-4	-8	$\frac{-1}{2} = -0.5$
0	3	0	0	undefined
1	4	2	8	2
2	5	2	10	$\frac{5}{2} = 2.5$
3	6	0	0	undefined
4	7	-4	-28	$\frac{7}{-4} = -1.75$
5	8	-10	-80	$\frac{-8}{10} = -0.8$



If unsure, use extra points.

$(f \div g)(x) = \frac{x+3}{-x^2+3x}$

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

V.A.: $x=0, x=3$

H.A.: $y = \frac{0}{-1} = 0$

The **domain** of:

$(f \times g)(x)$ is the intersection of the domains of $f(x)$ and $g(x)$.

intersection - $\cap$ And
union - $\cup$ Or

D_f: $\{x \in \mathbb{R}\}$ $D_{f \times g}$: $\{x \in \mathbb{R}\}$ $D_f \cap D_g$

$(f \div g)(x)$ is the intersection of the domains of $f(x)$ and $g(x)$
except in the case where $g(x) = 0$.

$D_{f \div g}$: $\{x \in \mathbb{R} \mid x \neq 0, 3\}$

Ex. 2: State the domain of $(f \div g)(x)$ where $f(x) = 3x^2$ and $g(x) = x^3 - 4x$.

$(f \div g)(x) = \frac{3x^2}{x^3 - 4x}$

$= \frac{3x^2}{x(x^2-4)}$

$= \frac{3x^2}{x(x-2)(x+2)}$ $x \neq 0, 2, -2$

$= \frac{3x}{(x-2)(x+2)}$ $\therefore D_{f \div g} : \{x \in \mathbb{R} \mid x \neq 0, 2, -2\}$

Hole at $x=0$

Practice: pp. 537-538 #4bd, 5bd, 8ab, 10AND p.542 #1bc, 2 (just for 1bc).