8.2 Product and Quotient Combinations

Definition 8.2.1

Given two functions $f(x)$, and $g(x)$ with domains D_f and D_g respectively, then we can **construct** new functions:

$F(x)=(f\cdot g)(x)$ $\quad = f(x)\cdot g(x)$

$D_{f\cdot g} = D_f \cap D_g$

$G(x)=\left(\frac{f}{g}\right)(x)$ $\quad = \frac{f(x)}{g(x)}$

$D_{\frac{f}{g}} = D_f \cap D_g,\ g(x)\neq 0$

Example 8.2.1

Determine $(f\cdot g)(x)$ given $f(x)=\{(-2,3),(-1,5),(0,3),(1,-3),(2,-5)\}$ and $g(x)=\{(-1,4),(0,-2),(1,7),(2,-2),(3,2)\}$

$D_f = \{-2,-1,0,1,2\}$

$(f\cdot g)(x) = \{(-1,20),(0,-6),(1,-21),(2,10)\}$ $\quad D_g = \{-1,0,1,2,3\}$

$D_{f\cdot g} = \{-1,0,1,2\}$

Example 8.2.2

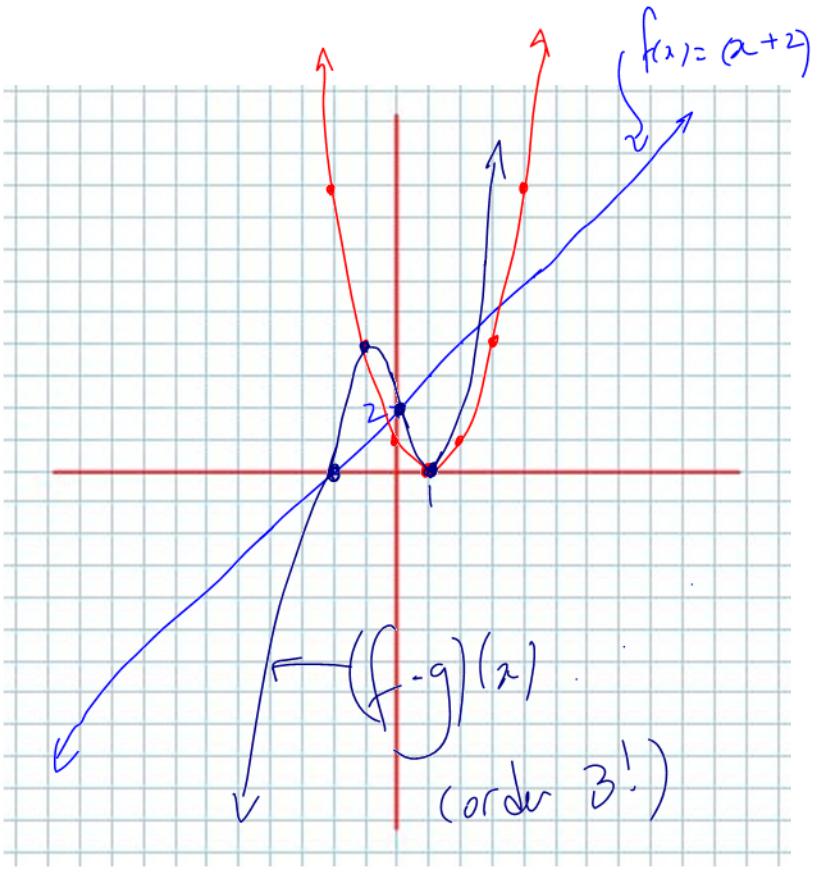
From your text: Pg. 537 #2 for #1e

Sketch the given pair of function on the same set of axes. State their domains. Use your sketch to draw $(f\cdot g)(x)$. State $(f\cdot g)(x)$ and $D_{f\cdot g}$.

$f(x)=x+2, \quad g(x)=x^2-2x+1$ $\quad = (x-1)^2$ vertex $(1,0)$

$D_f = (-\infty,\infty) = \{x\in\mathbb{R}\}$

$D_g = (-\infty,\infty)$



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

$(f\cdot g)(-2) = f(-2)\cdot g(-2) = (0)(9) = 0$

$(-2, 0)$

$(f\cdot g)(-1) = f(-1)\cdot g(-1) = (+1)(4) = 4$

$(-1, 4)$

$(f\cdot g)(0) = f(0)\cdot g(0) = (2)(1) = 2$

$(0, 2)$

$(f\cdot g)(1) = f(1)\cdot g(1) = (3)(0) = 0$

$(1, 0)$

Example 8.2.3

Determine the domain of $D_{f\cdot g}$ and $D_{f\div g}$ given $f(x)=\sqrt{2x+3}$ and $g(x)=\sec(x)$

$D_f = \left[-\frac{3}{2}, \infty\right)$

$2x+3 \geq 0$

$2x \geq -3$

$x \geq -\frac{3}{2}$

$\sec(x) = \frac{1}{\cos(x)}$

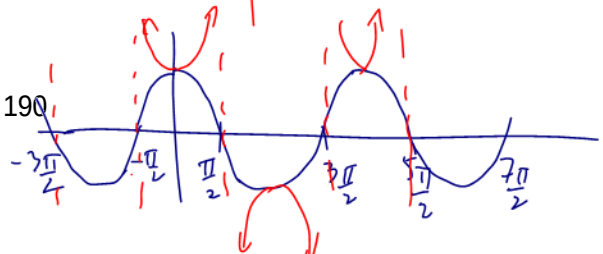
$D_g = \left\{ x \in \mathbb{R} \mid x \neq \frac{(2n+1)\pi}{2},\ n \in \mathbb{Z} \right\}$ (integers!)

$\Rightarrow$ Domain has "issues" when $\cos(x) = 0$ at all "odd $\frac{\pi}{2}$'s"

$D_{f\cdot g} = \left\{ x \geq -\frac{3}{2} \mid x \neq \frac{(2n+1)\pi}{2},\ n \in \mathbb{Z} \right\}$

$D_{\frac{f}{g}} = \left\{ x \geq -\frac{3}{2} \mid x \neq \frac{(2n+1)\pi}{2},\ n \in \mathbb{Z} \right\}$

Note $\sec(x) \neq 0$



Example 8.2.4

From your text: Pg. 542 #2 for 1d.

Sketch the given pair of function on the same set of axes. State their domains. Use your sketch to draw $\left(\frac{f}{g}\right)(x)$. State $\left(\frac{f}{g}\right)(x)$ and $D_{\frac{f}{g}}$.

you do this

$f(x) = x + 2$ and $g(x) = \sqrt{x-2}$

$D_f = \{x \in \mathbb{R}\}$

$D_g = \{x \in \mathbb{R} \mid x \geq 2\}$ or $[2, \infty)$

$D_f \cap D_g = [2, \infty)$

$D_{f/g} = (2, \infty)$ ← $x = 2$ makes $g(x) = 0$!

Class/Homework for Section 8.2 – READ ex 4 Pg. 536

Pg. 537 - 539 #1bd,3,8bd,10,15
Pg. 542 # 1aef, 2 (for #1aef)