Combining Functions Algebraically

These notes are intended as a summary of section 4.2 (p. 272 – 277) in your workbook. You should also read the section for more complete explanations and additional examples.

Adding Functions

The sum of two functions, $f(x)$ and $g(x)$, can be written as

$$f(x)+g(x) \qquad \text{or} \qquad (f+g)(x)$$

To draw the graph of $h(x)=f(x)+g(x)$, simply add the *y*-coordinates of $f(x)$ and $g(x)$ to get the *y*-coordinates of $h(x)$.

To evaluate $h(x)$ for a specific value of *x*, such as $h(2)$, simply add $f(2)$ and $g(2)$.

The domain of the function $h(x)$ is the set of values of *x* that $f(x)$ and $g(x)$ have in common.

Subtracting Functions

The difference of two functions, $f(x)$ and $g(x)$, can be written as

$$f(x)-g(x) \qquad \text{or} \qquad (f-g)(x)$$

To draw the graph of $h(x)=f(x)-g(x)$, simply subtract the *y*-coordinates of $g(x)$ from the *y*-coordinates of $f(x)$ to get the *y*-coordinates of $h(x)$.

To evaluate $h(x)$ for a specific value of *x*, such as $h(2)$, simply subtract $g(2)$ from $f(2)$.

The domain of the function $h(x)$ is the set of values of *x* that $f(x)$ and $g(x)$ have in common.

Multiplying Functions

The product of two functions, $f(x)$ and $g(x)$, can be written as

$$f(x)\cdot g(x) \qquad \text{or} \qquad (f\cdot g)(x)$$

To draw the graph of $h(x)=f(x)\cdot g(x)$, simply multiply the *y*-coordinates of $f(x)$ and $g(x)$ to get the *y*-coordinates of $h(x)$.

To evaluate $h(x)$ for a specific value of *x*, such as $h(2)$, simply multiply $f(2)$ and $g(2)$.

The domain of the function $h(x)$ is the set of values of *x* that $f(x)$ and $g(x)$ have in common.

Dividing Functions

The quotient of two functions, $f(x)$ and $g(x)$, can be written as

$$f(x)\div g(x) \qquad \text{or} \qquad (f\div g)(x)$$

To draw the graph of $h(x)=\dfrac{f(x)}{g(x)}$, simply divide the *y*-coordinates of $f(x)$ by the *y*-coordinates of $g(x)$ to get the *y*-coordinates of $h(x)$.

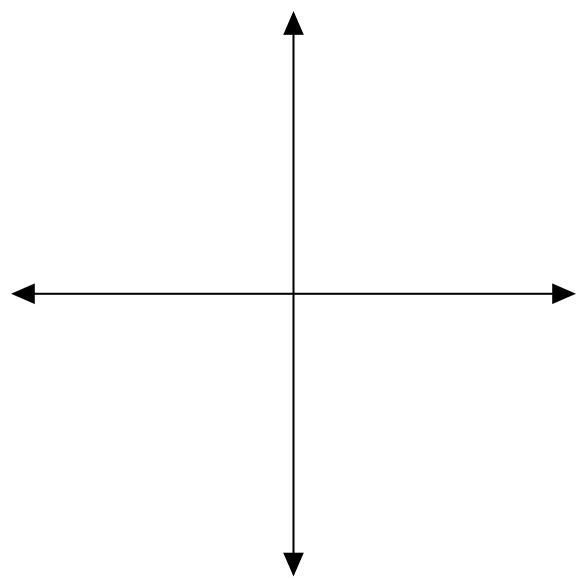
To evaluate $h(x)$ for a specific value of *x*, such as $h(2)$, simply divide $f(2)$ by $g(2)$.

The domain of the function $h(x)$ is the set of values of *x* that $f(x)$ and $g(x)$ have in common, and that $g(x)\neq 0$.

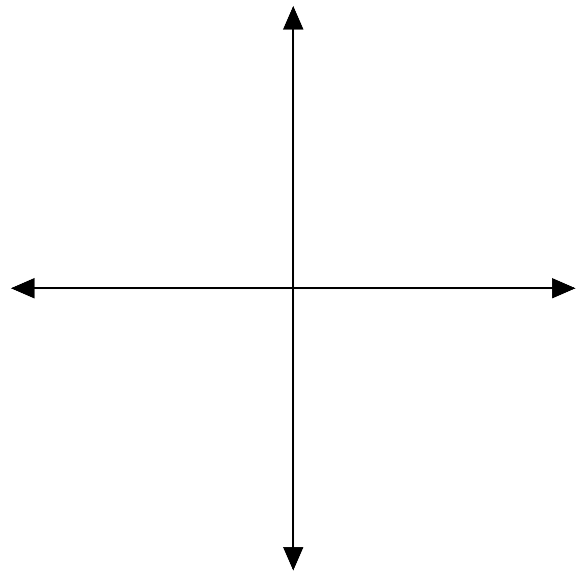
Example 1 (sidebar p. 274)
Use $f(x) = x + 2$ and $g(x) = |x|$.

a) State the domain and range of $f(x)$ and of $g(x)$.

b) Given $h(x) = f(x) + g(x)$, write an explicit equation for $h(x)$, then determine its domain and range.



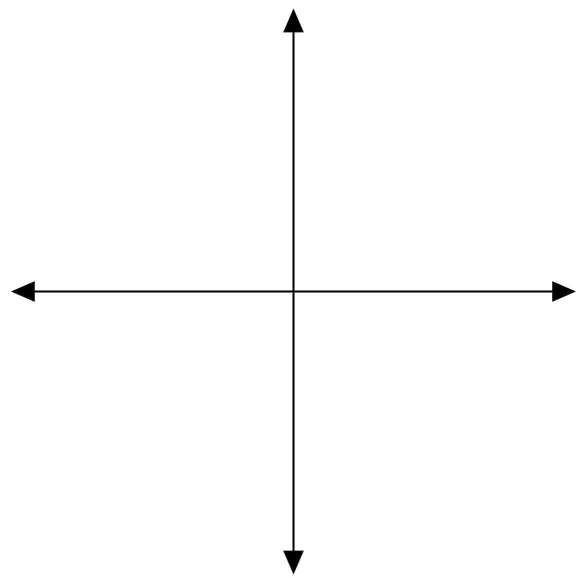
c) Given $p(x) = f(x) \cdot g(x)$, write an explicit equation for $p(x)$, then determine its domain and range.



Example 2 (sidebar p. 275)
Use $f(x)=\sqrt{x}$ and $g(x)=x-2$.

a) State the domain and range of $f(x)$ and of $g(x)$.

b) Given $q(x)=\dfrac{f(x)}{g(x)}$, write an explicit equation for $q(x)$, then determine its domain and range.



Example 3 (sidebar p. 276)
Consider the function $h(x) = 4 + 5x + 2x^3$.

a) Write explicit equations for four functions $f(x)$, $g(x)$, $n(x)$, and $m(x)$ so that $h(x) = f(x) + g(x) + n(x) + m(x)$.

b) Write explicit equations for two functions $f(x)$ and $g(x)$ so that $h(x) = f(x) - g(x)$.

Example 4 (sidebar p. 277)

a) Given $p(x) = x^2 - 9$, write explicit equations for two functions $f(x)$ and $g(x)$ so that $p(x) = f(x) \cdot g(x)$.

b) Given $q(x) = x + 1$, write explicit equations for two functions $f(x)$ and $g(x)$ so that $q(x) = \dfrac{f(x)}{g(x)}$.

Homework: #3, 5 – 8, 10, 13, 16 in the section 4.2 exercises (p. 278 – 284). Answers on p. 285.