Day 1

All you need to know about...
Power Functions and Function Operations

Function Notation	
The Symbol $f(x)$ is used in place of y.	Example: $y=2x-5 \Rightarrow f(x)=2x-5$
$f(x)$ is read as f of x.	This notation means the value of the function f at x.

Domain of a Function:
The values of x at which you are able to evaluate a function.

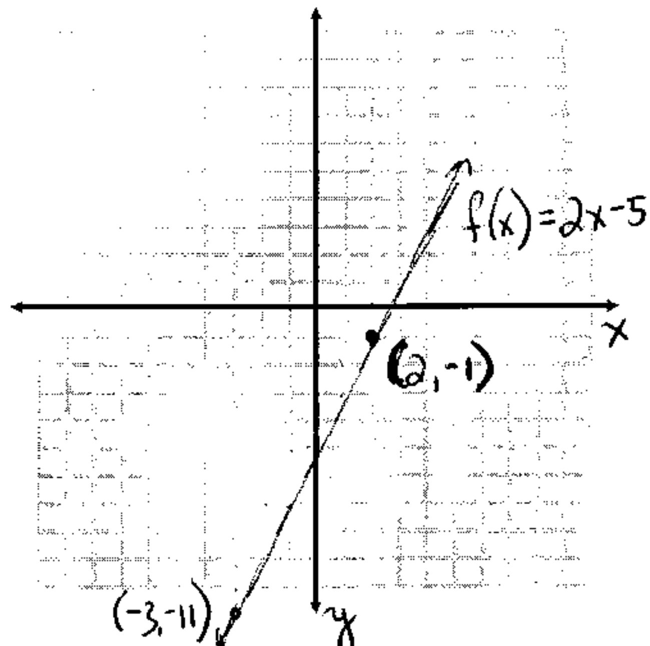
$y=mx+b$ $\quad y=ax^2+bx+c$

Linear, Quadratic, Polynomial Functions
D: All real #'s, $\mathbb{R}$

Power Functions

Even Roots $x^{1/2}$
D: All nonnegative real #'s $x \geq 0$

Odd Roots $x^{1/3}$
D: $\mathbb{R}$



Evaluating a Function using **Function Notation**	
Evaluate the function: $f(x)=2x-5$ $f(2)=2(2)-5$ $\quad 4-5$ $\quad f(2)=-1$ $f(-3)=2(-3)-5$ $\quad -6-5$ $\quad f(-3)=-11$	Evaluate the function: $g(x)=x^2+3$ $g(-1)=(-1)^2+3$ $\quad 1+3$ $\quad g(-1)=4$ $g(4)=4^2+3$ $\quad 16+3$ $\quad g(4)=19$
Evaluate the function: $h(x)=2x^{1/2}$ $h(9)=2\cdot 9^{1/2}$ $\quad 2\cdot\sqrt{9}$ $\quad 2\cdot 3$ $\quad 6$ $\quad h(9)=6$ $h(-4)=2\cdot(-4)^{1/2}$ $\quad 2\cdot\sqrt{-4}$	Evaluate the function: $j(x)=x^{1/3}-5$ $j(-8)=(-8)^{1/3}-5$ $\quad \sqrt[3]{-8}-5$ $\quad -2-5$ $\quad -7$ $\quad j(-8)=-7$ $j(1)=1^{1/3}-5$ $\quad \sqrt[3]{1}-5$ $\quad j(1)=-4$

No Real #

$1-5$

-4

Tues

Day 2

Operations with Functions

OPERATION	Definition	Example: $f(x) = -x$, $g(x) = 2x + 1$ ℝ ℝ
Addition	$h(x) = f(x) + g(x)$	$h(x) = -x + 2x + 1$ $x + 1$ $h(x) = x + 1$ D: ℝ
Subtraction	$h(x) = f(x) - g(x)$	$h(x) = -x - (2x + 1)$ $= -x - 2x - 1$ $h(x) = -3x - 1$ D: ℝ

Finding the Domain:

1. The domain of $h(x)$ consists of the x-values that are in the domains of *both* $f(x)$ and $g(x)$.

Example 1 **Adding Functions**

Let $f(x) = 5x^{1/3}$ and $g(x) = 2x^{1/3}$ Find **(a)** the sum of the functions and **(b)** the domain of the sum.

Solution:

① $f(x) + g(x) = 5x^{1/3} + 2x^{1/3}$

$= 7x^{1/3}$

② $f(x) + g(x) = 7x^{1/3}$

D: ℝ

Steps:

① Substitute

② Combine like radicals

③ Domain

Example 2 **Subtracting Functions**

Let $f(x) = 4x^{1/4}$ and $g(x) = 9x^{1/4} - 3$. Find **(a)** $f(x) - g(x)$ and **(b)** the domain of the difference.

Solution:

① $f(x) - g(x) = 4x^{1/4} - (9x^{1/4} - 3)$

$4x^{1/4} - 9x^{1/4} + 3$

$f(x) - g(x) = -5x^{1/4} + 3$

D: $x \geq 0$

Steps:

① Substitute. Don't forget ( )

② Dist the −

③ Combine like terms

④ Domain

Day 3

More Operations with Functions

OPERATION	Definition	**Example:** $f(x) = -x$, $\mathbb{R}$ $g(x) = 2x + 1$ $\mathbb{R}$
Multiplication	$h(x) = f(x) \cdot g(x)$	$-x(2x+1)$ $-2x^2 - x$ D: $\mathbb{R}$
Division	$h(x) = \dfrac{f(x)}{g(x)}$	$\dfrac{-x}{2x+1}$ D: $x \neq -\frac{1}{2}$

Finding the Domain:

1. The domain of $h(x)$ consists of the x-values that are in the domains of *both* $f(x)$ and $g(x)$.

2. The **domain of a quotient** does **not** include x-values for which $g(x) = 0$.

Example 3

Multiplying Functions

Let $f(x) = 4x^{1/3}$ and $g(x) = x^{1/2} + 2$. Find **(a)** $f(x) \cdot g(x)$ and **(b)** the domain of the product.

Solution:

$\frac{1}{3} + \frac{1}{2}$

$\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$

$4x^{1/3} \cdot (x^{1/2} + 2)$

$\boxed{4x^{5/6} + 8x^{1/3}}$ D: $\{x \mid x \geq 0\}$

Steps:

① subst.

② distribute

③ D:

Example 4

Dividing Functions

Let $f(x) = 4x^{1/3}$ and $g(x) = x^{1/2}$. Find **(a)** $\dfrac{f(x)}{g(x)}$ and **(b)** the domain of the quotient.

Solution:

$\dfrac{4x^{1/3}}{x^{1/2}} = 4x^{-1/6}$

$= \dfrac{4}{x^{1/6}} \cdot \dfrac{x^{5/6}}{x^{5/6}}$

$\boxed{= \dfrac{4x^{5/6}}{x}}$

D: $\{x \mid x > 0\}$

Steps:

① substitute

② divide

③ domain

Day 4

One Last Operation with Functions

OPERATION	Definition	Example: $f(x) = 3x + 2$, $\mathbb{R}$ $g(x) = 2x$ $\mathbb{R}$
Composition	$h(x) = f(g(x))$	$f(g(x)) = f(2x)$ $= 3(2x) + 2$ $6x + 2$ Domain: $\mathbb{R}$
$g(3) = 2(3)$ $= 6$	$f(g(3)) = f(6)$ $= 3 \cdot 6 + 2$ $18 + 2 = 20$	$g(f(x)) = g(3x+2)$ $= 2(3x+2)$ $= 6x + 4$ D: $\mathbb{R}$
Finding the Domain: 1. The domain of $h(x)$ consists of the x-values that are in the domains of *both* $f(x)$ and $g(x)$.		

Example 5

Composition of Functions

D: $\mathbb{R}$ D: $x \geq 0$

Let $f(x) = 9x^{2/3}$ and $g(x) = x^{1/2}$.

Find: **(a)** $f(g(x)) = f(x^{1/2})$

$9(x^{1/2})^{2/3}$

$9x^{2/6} = 9x^{1/3}$

(b) the domain of $f(g(x))$.

D: $x \geq 0$

(c) $g(g(x)) = g(x^{1/2})$

$= (x^{1/2})^{1/2} = x^{1/4}$

D: $x \geq 0$

(d) $g(f(8)) =$

$f(8) = 9 \cdot 8^{2/3} = 9 \cdot (\sqrt[3]{8})^2 = 9 \cdot 2^2 = 36$

$g(36) = 36^{1/2} = \sqrt{36} = 6$

Example 6

Composition of Functions

Let $h(x) = x^2 + 3x$ and $g(x) = x - 2$. Find **(a)** $h(g(x))$ and **(b)** the domain of $h(g(x))$.

$h(g(x)) = h(x-2)$

$= (x-2)^2 + 3(x-2)$

FOIL

$= x^2 - 4x + 4 + 3x - 6$

$= \boxed{x^2 - x - 2}$

D: $\mathbb{R}$

$(x-2)^2 =$

$(x-2)(x-2)$

FOIL

$x^2 - 2x - 2x + 4$