Section 3.1 Guided Notebook

Section 3.1 Relations and Functions

- ☐ Work through Objective 1
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- ☐ Work through Objective 4
- ☐ Work through Objective 5
- ☐ Work through Objective 6

Section 3.1 Relations and Functions

Section 3.1 Objective 1 Understanding the Definitions of Relations and Functions

Watch the video that accompanies the definition of a relation and take notes here:

Write down the definition of a **relation.**

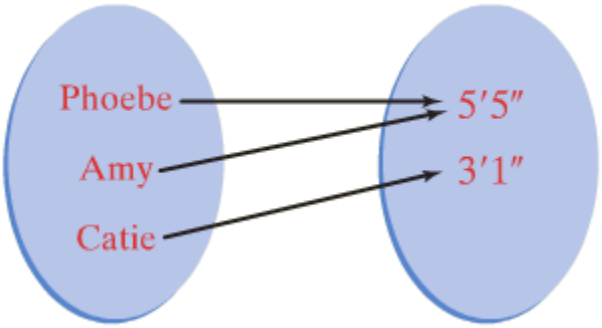
Write an example of a relation as seen in the video and state the domain and range of the relation.

Write down the definition of a **function.**

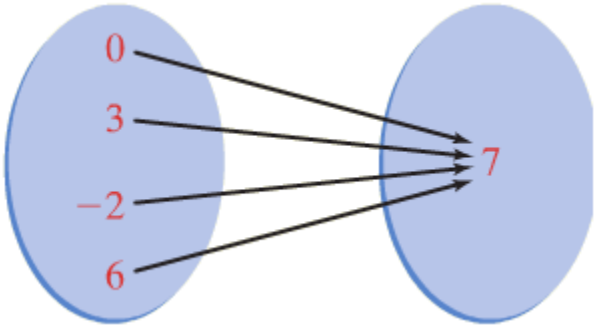
Read through the text preceding Example 1 to further clarify functions and relations and take notes here.

Work through the video that accompanies Example 1 and take notes here:
Determine whether each relation is a function, and then find the domain and range.

a.



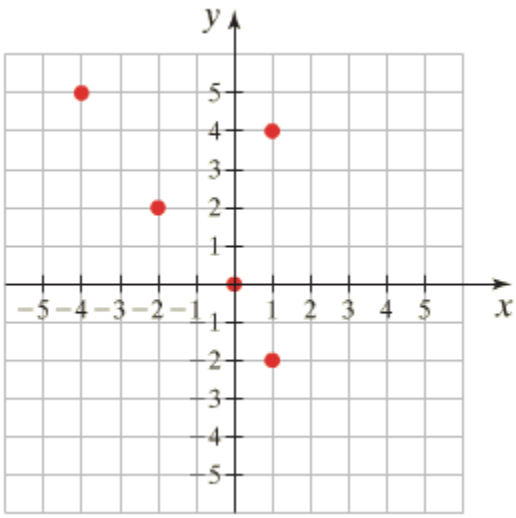
b.



c. $\{(3, 7), (-3, 2), (-4, 5), (1, 4), (3, -4)\}$

d. $\{(-1, 2), (0, 2), (1, 5), (2, 3), (3, 2)\}$

Work through Example 2 and take notes here: Use the domain and range of the following relation to determine whether the relation is a function.



Section 3.1 Objective 2 Determining Whether Equations Represent Functions

Work through the interactive video that accompanies Example 3 and take notes here:

Determine whether the following functions represent y as a function of x.

a. $3x - 2y = -12$

b. $y = 3x^2 - x + 2$

c. $(x + 3)^2 + y^2 = 16$

Section 3.1 Objective 3 Using Function Notation; Evaluating Functions

Carefully take notes from the video that accompanies Objective 3.

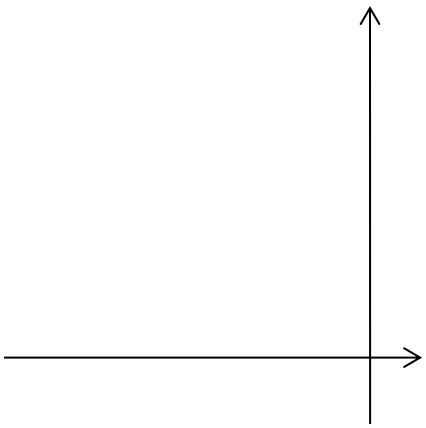
What is the definition of an **independent variable**?

What is the definition of a **dependent variable**?

Fill out the following table as seen in this video. (Add more values if you wish.)

Domain Value x	**Range Value** $f(x)=\frac{3}{2}x+6$	**Ordered Pair** $(x, f(x))$

Now sketch the function $f(x)=\frac{3}{2}x+6$ using your values from the table .



Work through the interactive video that accompanies Example 4 and take notes here:

Rewrite these equations using function notation where *y* is a function of *x*. Then answer the question following each equation.

a. $3x - y = 5$

What is the value of $f(4)$?

b. $x^2 - 2y + 1 = 0$

Does the point $(-2,1)$ lie on the graph of this function?

c. $y + 7 = 0$

What is $f(x)$ when $x = 3$?

Work through Example 5:

Given that $f(x) = x^2 + x - 1$, evaluate the following:

a. $f(0)$

b. $f(-1)$

c. $f(x+h)$

d. $\dfrac{f(x+h) - f(x)}{h}$ (Note that there is a video solution to part d.)

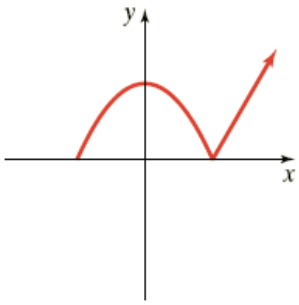
Section 3.1 Objective 4 Using the Vertical Line Test

Watch the video that accompanies Objective 4 and write your notes here:

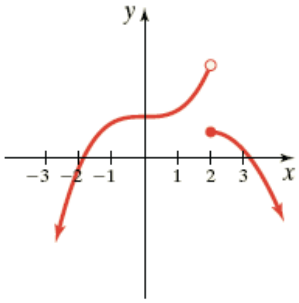
In your own words, explain how the **vertical line test** works:

Work through Example 6 in your eText and take notes here: Use the vertical line test to determine which of the following graphs represents the graph of a function.

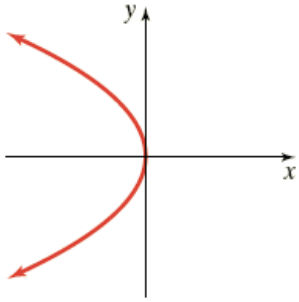
a.



b.



c.



Section 3.1 Objective 5 Classifying Functions

Define a **polynomial function** here:

Give an example of a polynomial function here:

Work through the video that accompanies Example 7 and take notes here:
Determine whether the following functions are polynomial functions. If the function is a polynomial function, state the degree of the polynomial function.

a. $f(x) = 7 - 3x^2 + 5x^3$ b. $h(t) = -11$ c. $f(t) = 3t^6 + \frac{1}{t}$

Define a **rational function** here:

Write down the **Tip** that can be seen below the definition of a rational function.

Give an example of a rational function here:

Work through the video that accompanies Example 8 and take notes here:
Determine whether the following functions are rational functions.

a. $f(t) = \dfrac{t^3 - 1}{t + 1}$

b. $h(x) = (x^3 - x^2 - 9)x^{-5}$

Section 3.1

Define a **root function** here:

Give an example of two different root functions. One root function should be an odd root function and the other should be an even root function.

Section 3.1 Objective 6 Determining the Domain of a Function Given the Equation

Carefully work through the video that accompanies Objective 6 and fill in the following blanks:

The **domain of a function** $y = f(x)$ is the set of _____ of ___ for which the function is _____.

The domain of every **polynomial function** is _____ .

The domain of every **rational function** is the set of all _____ numbers such that _____ .

The Domain of a Root Function of the Form $f(x) = \sqrt[n]{g(x)}$

1. If n is even, then the domain is the solution to the inequality _____ .

2. If n is odd, then the domain is the set of all _____ numbers for which _____ is defined.

Below is a summary of the three classifications of functions seen in the previous video and a summary of how to find the domain of each. Use this summary for future reference.

Class of Function	Form	Domain
Polynomial functions	$f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$	Domain is $(-\infty, \infty)$.
Rational functions	$f(x) = \dfrac{g(x)}{h(x)}$, where $g \neq 0$ and h are polynomial functions such that the degree of $h(x)$ is greater than 0.	Domain is all real numbers such that $h(x) \neq 0$.
Root functions	$f(x) = \sqrt[n]{g(x)}$, where $g(x)$ is a function and n is an integer such that $n \geq 2$.	1. If n is even, the domain is the solution to the inequality $g(x) \geq 0$. 2. If n is odd, the domain is the set of all real numbers for which g is defined.

Work through interactive video that accompanies Example 9 and explain how to find the domain of each of the following functions:

a. $f(x) = 2x^2 - 5x$

b. $f(x) = \dfrac{x}{x^2 - x - 6}$

c. $h(x) = \sqrt{x^2 - 2x - 8}$

d. $f(x) = \sqrt[3]{5x - 9}$