Section 3.3 Guided Notebook

Section 3.3 Graphs of Basic Functions; Piecewise Functions

- ☐ Work through Objective 1
- ☐ Work through Objective 2
- ☐ Work through Objective 3
- ☐ Work through Objective 4

Section 3.3 Graphs of Basic Functions; Piecewise Functions

Section 3.3 Objective 1 Sketching the Graphs of the Basic Functions

Read through all the text in Objective 1. **YOU MUST MEMORIZE THE GRAPHS** of the 9 basic functions seen on these pages! On the next three pages of this notebook, sketch each of these functions and list the properties of each. Click on the appropriate link in your eText to see the properties of each function.

1. The constant function $f(x) = b$

2. The identity function $f(x) = x$

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3.

4. The square function $f(x) = x^2$

5. The cube function $f(x) = x^3$

6. The absolute value function $f(x) = |x|$

7. The square root function $f(x) = \sqrt{x}$

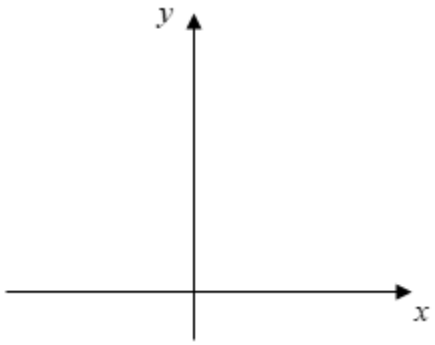
8. The cube root function $f(x) = \sqrt[3]{x}$

9. The reciprocal function $f(x) = \frac{1}{x}$

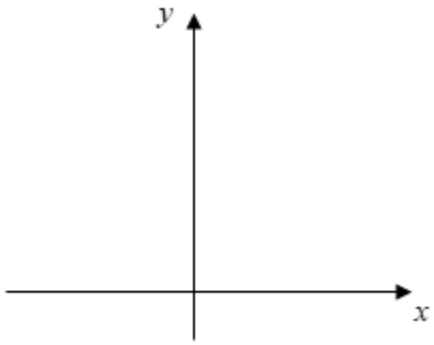
10. The greatest integer function $f(x) = \|x\|$

Section 3.3 Objective 2 Sketching the Graphs of Basic Functions With Restricted Domains

Sketch the graph of $f(x) = x^2$.



Now sketch the graph of $f(x) = x^2$ for $x > 0$.



Fill in the blank:

The function $f(x) = x^2$ for $x > 0$ is known as a function with a _____ domain.

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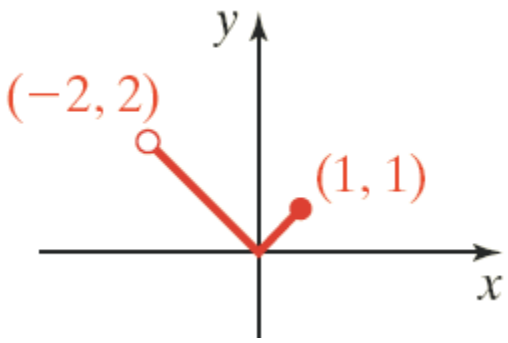
Work through the video that accompanies Example 1 and show your work here:

Sketch the function $f(x) = \sqrt{x}$ for $x \geq 1$.

Work through the video that accompanies Example 2 and show your work here:

The graph of a basic function with a restricted domain is given below.

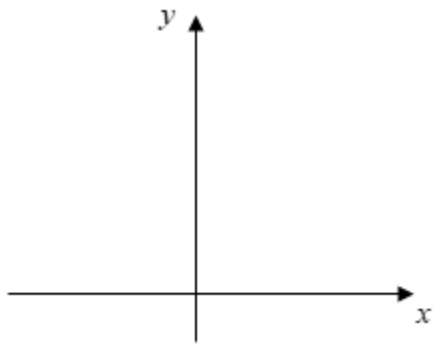


a. Write the domain of the function using interval notation.

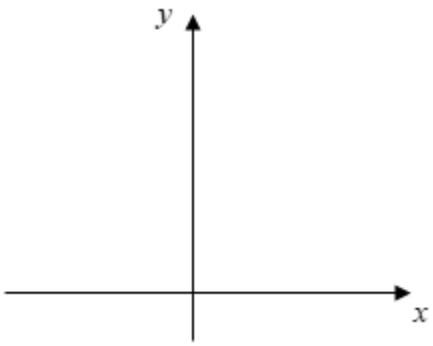
b. Define the function using an inequality to express the restricted domain.

Section 3.3 Objective 2 Analyzing Piecewise-Defined Functions

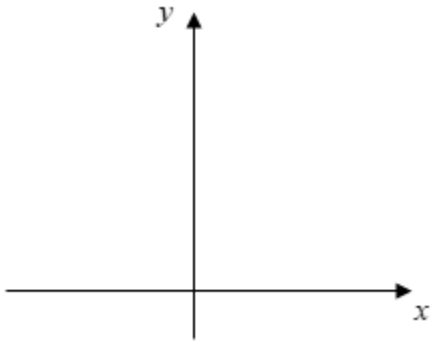
Sketch the graph of the restricted function $y = -x$ for $x < 0$.



Now, sketch the graph of the restricted function $y = x$ for $x \geq 0$.



Now, draw **both** of the above two graphs onto the grid below:



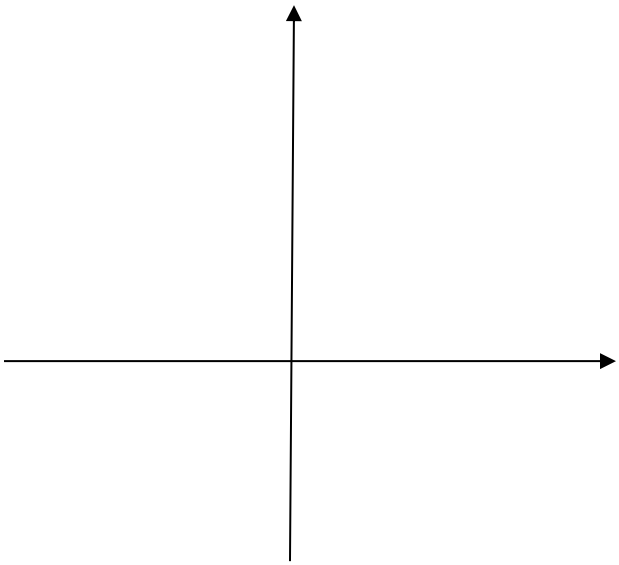
This is the graph of the absolute value function. Define the absolute function by filling in the blanks below:

$$f(x) = |x| = \begin{cases} y = -x & \text{for } \_\_\_\_\_ \\ y = x & \text{for } \_\_\_\_\_ \end{cases}.$$

What is the definition of a **piecewise-defined function?**

Carefully work through the **animation** that accompanies Example 3 and take notes here: (You should use a pencil to sketch piecewise functions. Why? Watch the animation to find out.)

Sketch the function $f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ 1 - x & \text{if } x \geq 1 \end{cases}$

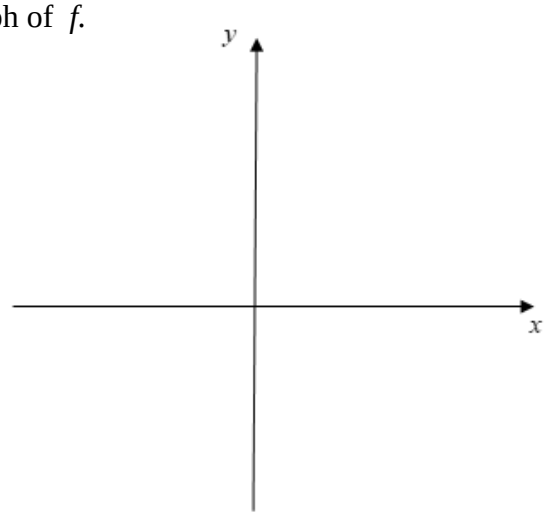


Work through the video that accompanies Example 4 and take notes here:

$$\text{Let } f(x)=\begin{cases}1 & \text{if } x<-1\\ \sqrt[3]{x} & \text{if } -1\le x<0\\ \dfrac{1}{x} & \text{if } x>0\end{cases}$$

a. Evaluate $f(-3)$, $f(-1)$, and $f(2)$.

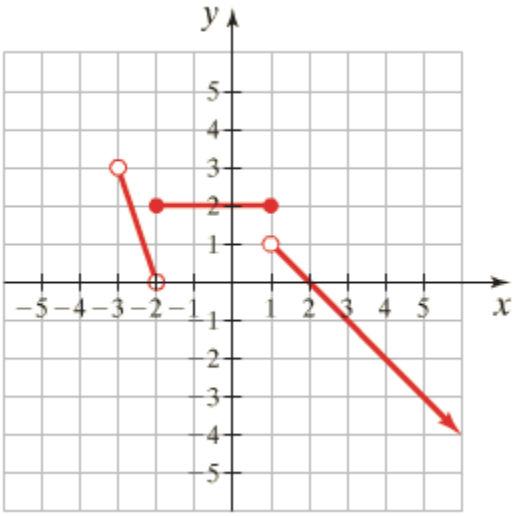
b. Sketch the graph of f.



c. Determine the domain of *f*.

d. Determine the range of *f*.

Work through the video that accompanies Example 5 and take notes here:
Find a rule that describes the following piecewise function:



Section 3.3 Objective 4 Solving Applications of Piecewise-Defined Functions

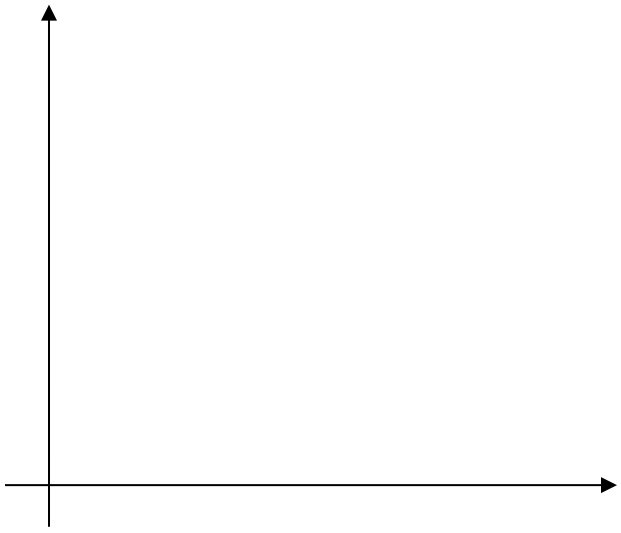
Work through Example 6 taking notes here:

Ted Cruz, a presidential candidate during the 2016 Republican presidential primaries, proposed a flat tax to replace the existing U.S. income tax system. In his tax proposal, every adult would pay $0.00 in taxes on the first $36,000 earned. They would then pay a flat tax of 10% on everything over $36,000. Cruz's tax plan can be described using a piecewise-defined function.

a. According to Cruz's plan, how much in taxes are owed for someone earning $62,500?

b. Find the piecewise function, $T(x)$, that describes the amount of taxes paid, T, as a function of the dollars earned, x, for Cruz's tax plan.

c. Sketch the piecewise function, $T(x)$.



Work through the video that accompanies Example 7 taking notes here:

Cheapo Rental Car Co. charges a flat rate of $85 to rent a car for up to 2 days. The company charges an additional $20 for each additional day (or part of a day).

a. How much does it cost to rent a car for 2 ½ days? 3 days?

b. Write and sketch the piecewise function, $C(x)$, that describes the cost of renting a car as a function of time, x, in days rented for values of x less than or equal to 5.