

(1)

Notes on ICNS 100

Chapter 2: 2.5 Graphs in Rectangular Coordinates

1. An x -intercept of the graph of an equation in x and y is a point where the graph intersects the x -axis. A y -intercept is a point where the graph intersects the y -axis.

Examples

- (a) Find the x - and y -intercepts of the graph of $y = 2x + 3$, and sketch the graph.
 - (b) Determine the intercepts, if any, of the graph of $s = 100/t$, and sketch the graph.
 - (c) Determine the intercepts of the graph of $x = 3$, and sketch the graph.
2. Each function f gives rise to an equation, namely $y = f(x)$. Its graph consists of all points $(x, f(x))$, where x is in the domain of f .
 - (a) Graph $f(x) = \sqrt{x}$. (Square-root function)
 - (b) Graph $p = G(q) = |q|$. (Absolute-value function)
 3. A zero of a function f is any value of x such that $f(x) = 0$.
 4. The zeros of a function are precisely the x -intercepts of its graph.
 5. How to determine the domain and range of a function by looking at its graph?

Answer: In general, the domain consists of all x -values that are included in the graph, and the range is all y -values that are included. For example, the domain and range of $f(x) = \sqrt{x}$ are all nonnegative numbers, while the domain of $p = G(q) = |q|$ is all real numbers and the range is all $p \geq 0$.

Example

- (a) Graph the case-defined function

$$f(x) = \begin{cases} x & \text{if } 0 \leq x < 3 \\ x - 1 & \text{if } 3 \leq x \leq 5 \\ 4 & \text{if } 5 < x \leq 7 \end{cases}$$

6. How to tell whether a curve is the graph of a function?

Answer: Apply the vertical-line test: If a vertical line L can be drawn that intersects a curve in at least two points, then the curve is not the graph of a function of x , and when no such vertical line can be drawn, the curve is the graph of a function of x .

Example

(a) Graph $x = 2y^2$.

7. After we know that a curve in question is the graph of a function, how to determine whether this function is one-to-one?

Answer: Apply the horizontal-line test: If a horizontal line L can be drawn that intersects the graph of a function in at least two points, then the function is not one-to-one, and when no such horizontal line can be drawn, the function is one-to-one.

Assignment Do Problems 2.5: 6, 10, 12, 14, 30, 32, 36, 40.