MATH 11009: Piecewise-Defined Functions & Power Functions Section 3.3

- **Piecewise-Defined Function:** A **piecewise-defined function** is a function defined in "pieces", where different output formulas are used for different parts of the domain.

Example 1: Find the following if

$$f(x) = \begin{cases} -9x + 2 & \text{if } x < -1 \\ 3x^2 - 2x + 1 & \text{if } -1 \leq x < 4 \\ 2x - 3 & \text{if } x \geq 4 \end{cases}$$

(a) $f(4) =$

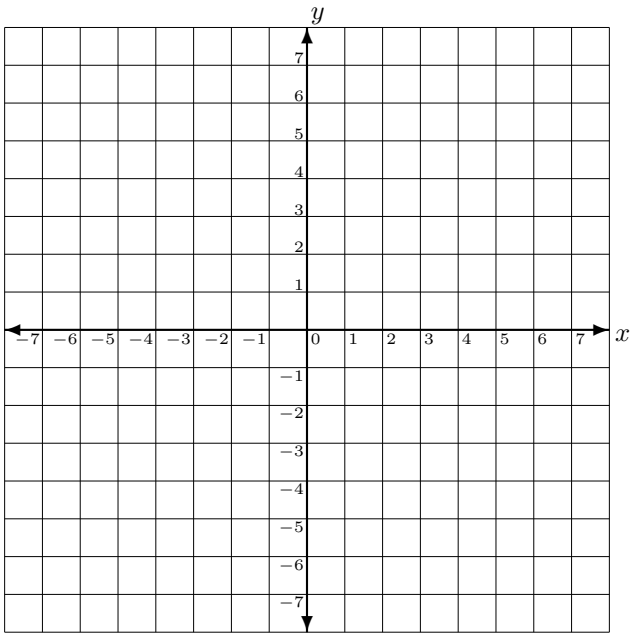
(b) $f(-3) =$

(c) $f(-1) =$

(d) $f(0) =$

Example 2: Graph the following function:

$$f(x) = \begin{cases} 2 & \text{if } x < 0 \\ 2x - 3 & \text{if } 0 \leq x < 4 \\ -2x + 7 & \text{if } x \geq 4 \end{cases}$$



- **Absolute Value Function:** The **absolute value function**, $f(x) = |x|$, is a piecewise-defined function.

$$|x| = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$

- **Absolute Value Equations:** Let $c > 0$. Then

$$|ax + b| = c \qquad \text{is equivalent to} \qquad ax + b = c \quad \text{or} \quad ax + b = -c$$

  * CAUTION: Before rewriting the absolute value equation, make sure the absolute value is isolated on one side. Do NOT rewrite until the absolute value is isolated.

Example 3. Solve the following equations.

(a) $|2x - 3| = 7$

(c) $20 + |2x - 4| = 25$

(b) $4\,|3x + 2| = 16$

(d) $6 - |2x + 1| = 2$