

**Math 1314**  
**Lesson 1: Prerequisites**

**1. Identifying Polynomials**

To begin with, let's review the definition of a polynomial function.

A **polynomial** is the sum and/or difference of terms that contain variables and/or real constants, with variables raised to whole number (0, 1, 2, 3, ...) powers.

Example 1: Which of the following are polynomial functions?

a.  $f(x) = -2x^5 + 0.5x + \frac{3}{2}$

f.  $f(x) = \frac{x^6 - e}{x + 2}$

b.  $f(x) = \sqrt{3}x^3 - 2x^{-3}$

g.  $f(x) = \ln(x^2 - 3)$

c.  $f(x) = \frac{1}{x^4} - 10x$

h.  $f(x) = 3e^{3x} - 1$

d.  $f(x) = x^3 - 2x^2 + \frac{3}{2}x - \sqrt{5}$

i.  $f(x) = -5$

e.  $f(x) = 5x^{0.5} - 0.5x^{\frac{1}{8}}$

**2. Domain**

The **domain** of a function is the set of all values of the independent variable(s) for which a function is defined, i.e. yields real-valued results.

Example 2: Find the domain of each of the following functions.

a.  $f(x) = x^2 + 4$

b.  $f(x) = 2e^x + 3$

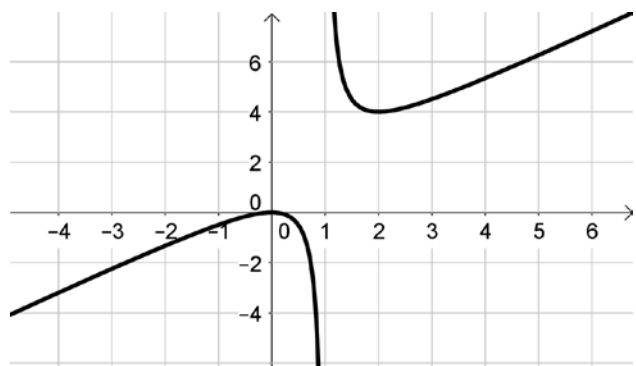
c.  $f(x) = x^{\frac{4}{5}}$

d.  $f(x) = \sqrt{-2x + 1}$

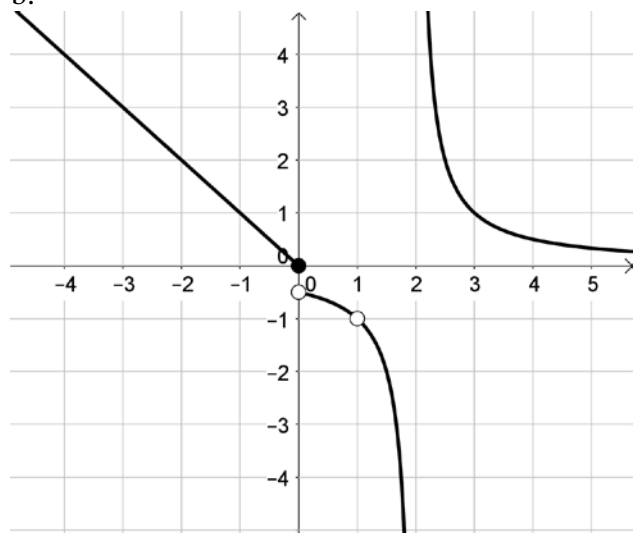
e.  $f(x) = \frac{x^2 + 7x + 12}{x^2 - 2x - 15}$

Example 3: Given the graph of a function below, give the domain.

a.



b.



### 3. *Multiplying, Solving and Evaluating Functions*

Example 4: Multiply and Simplify.

$$-2x^2 + x - (x-1)(x+5)$$

Example 5: Find the roots of each function below.

a.  $f(x) = 6x^3 - 22x^2 - 8x$ .

b.  $f(x) = 81x^2 - 11$

Example 6: Find  $f(-2)$  for each function below, if possible.

a.  $f(x) = x^3 + 10x$

b.  $f(x) = \frac{x-10}{x^2-4}$

Example 7: Let  $f(x) = x^2 - 3$ , calculate  $\frac{f(6) - f(1)}{6-1}$ .

Example 8: Suppose the total cost in dollars to produce  $x$  items is given by the function  $C(x) = 0.0003x^3 + 0.14x^2 + 12x + 1400$ . Find the total cost of producing 50 items.

#### 4. Analyzing Graphs of Polynomials

Graphs of a polynomial functions have nice, smooth curves, no sharp corners, no holes, and no asymptotes.



The **end behavior** of a polynomial function is the behavior of the polynomial to the far left and far right of the graph. If we are given only the function and not the graph, we can determine the end behavior by simply looking at its leading term (term with the highest power on the variable  $x$ ).

An even-degree polynomial's end behavior will be  $\uparrow\uparrow$  if its leading coefficient is positive or  $\downarrow\downarrow$  if its leading coefficient is negative.

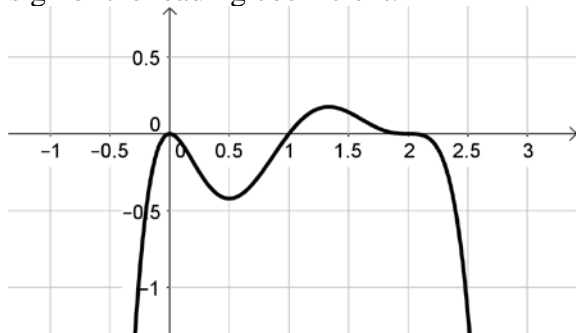


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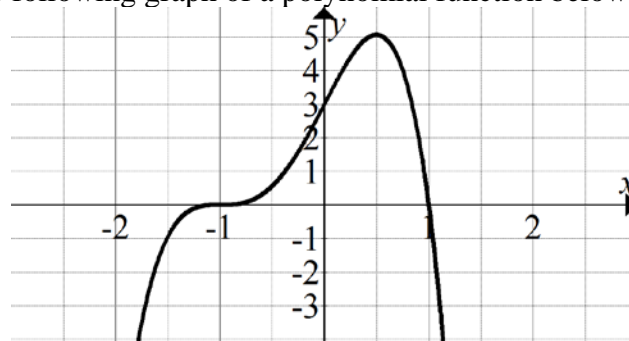


Example 9: Determine the end behavior of  $f(x) = -3x^5 + 2x$ .

Example 10: Given the following graph of a polynomial function, give the function's degree and sign of the leading coefficient.



Example 11: Given the following graph of a polynomial function below.



- For which x-value(s) is the function equal to 0.
- Give the interval(s) over which the function is negative; positive.

## 5. Piecewise Defined Functions

A function that is defined by two (or more) equations over a specified domain is called a **piecewise function**.

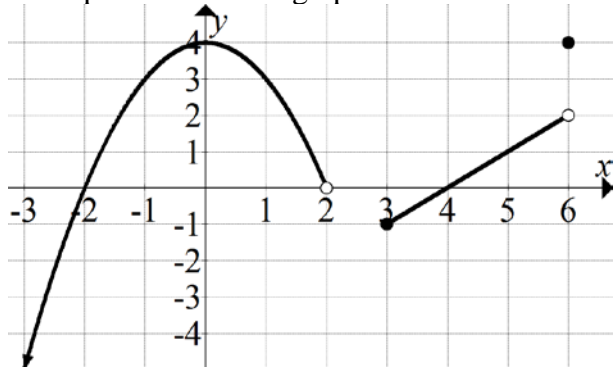
Example 12: Let  $f(x) = \begin{cases} x^3 - 1, & x < -1 \\ 10e^{3x} + 6, & -1 \leq x < 3 \\ x + 5, & x \geq 3 \end{cases}$ .

Find:

a.  $f(0)$ .

b.  $f(-2)$ .

Example 13: Use the graph above to find each of the following.



a.  $f(6)$

b.  $f(2)$

c. For which x-value(s) is  $f(x) = 3$ .

Now you can take Practice Test 1 (up to 20 times) then take Test 1 (up to 2 times) from anywhere online (no CASA reservation needed).