

Polynomials

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

n = non-negative real number

a_0, a_1, \dots, a_n = coefficients of polynomial

Domain $(-\infty, \infty)$

$$f(x) = mx + b, \quad f(x) = |mx + b|$$

$$n = 1$$

$$a_1 = m$$

$$a_0 = b$$

$$f(x) = 2x^2 - 1, \quad f(x) = \underset{n, a_2}{2x^2} + \underset{a_1}{0} + \underset{a_0}{(-1)}$$

$$n = 2$$

$$a_2 = 2$$

$$a_1 = 0$$

$$a_0 = -1$$

Domain $(-\infty, \infty)$

Degree = 2

Range: Vertex of $ax^2 + bx + c$

$$x = \frac{-b}{2a} \quad (1)$$

$$\underset{a}{2}x^2 + \underset{b}{0}x - \underset{c}{1}$$

(2)

$$x = \frac{-(0)}{2(2)}$$

$$x = 0$$

$$f(0) = 2(0)^2 + 0 - 1$$

(3)

$$f(0) = -1$$

Range: $[-1, \infty)$

Root Functions

$$f(x) = x^{1/n}$$

$$x^{1/n} = \sqrt[n]{x}$$

Domain if n is an even positive: $[0, \infty)$

Domain if n is an odd positive: $(-\infty, \infty)$

$$f(x) = x^{1/2}$$

$$\text{Domain: } [0, \infty)$$

$$\text{Range: } x^{1/2} = \sqrt{x}$$

$$\begin{array}{c} \text{"} \\ (y)^2 = (\sqrt{x})^2 \\ \text{"} \end{array}$$

$$y^2 = x$$

$$[0, \infty)$$

$$f(x) = x^{1/3}$$

$$\text{Domain: } (-\infty, \infty)$$

$$\text{Range: } x^{1/3} = \sqrt[3]{x}$$

$$\begin{array}{c} \text{"} \\ (y)^3 = (\sqrt[3]{x})^3 \\ \text{"} \end{array}$$

$$y^3 = x$$

$$(-\infty, \infty)$$

Rational Functions

$$f(x) = \frac{1}{x+1}$$

Domain:

$$x+1=0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \end{array}$$

$$x = -1$$

$$(-\infty, -1) \cup (-1, \infty)$$

$$f(x) = \frac{1}{x}$$

$$\text{Domain: } (-\infty, 0) \cup (0, \infty)$$

$$\text{Range: } \underset{\text{"}}{\frac{x}{1}}(y) = \left(\frac{1}{x}\right)\underset{\text{"}}{\frac{x}{1}}$$

$$\frac{xy}{y} = \frac{1}{y}$$

$$x = \frac{1}{y}$$

$$(-\infty, 0) \cup (0, \infty)$$

$$f(x) = \frac{1}{4x-16}$$

Domain:

$$4x-16=0$$

$$\begin{array}{r} +16 \quad +16 \\ \hline \end{array}$$

$$\frac{4x}{4} = \frac{16}{4}$$

$$x = 4$$

$$(-\infty, 4) \cup (4, \infty)$$

$$\text{Range: } y = \frac{1}{4x-16}$$

$$(4x-16)y = \frac{1}{\cancel{4x-16}} (\cancel{4x-16})$$

$$\frac{y(4x-16)}{y} = \frac{1}{y}$$

$$4x-16 = \frac{1}{y} \quad (-\infty, 0) \cup (0, \infty)$$