Polynomial and Rational Functions

Source: D.Lippman, M.Rasmussen (2012) *Precalculus: An Investigation of Functions* (Edition 1.3)

Polynomials	The sum of terms each consisting of a transformed power function with positive whole number $$f(x) = a_0 + a_1x + a_2x^2 + \cdots + a_nx^n$$ Is any one piece of the sum that is any a_ix^i Is the highest power of the variable Is term with highest degree Is the coefficient of the leading term
Quadratic Functions	Standard form is $f(x) = ax^2 + bx + c$ Transformation form is $f(x) = a(x-h)^2 + k$ Vertex located in (h, k) $h = -\frac{b}{2a}$ $k = f(h) = f(\frac{-b}{2a})$
Rational Function	The function that can be written as the ratio of two polynomials
Vertical asymptotes	Occur where the denominator of the function is equal to zero and numerator is not zero
Horizontal asymptotes	Can be determines by looking at the degrees of the numerator and denominator Degree of denominator > degree of numerator: Horizontal asymptote at y = 0 Degree of denominator < degree of numerator: No horizontal asymptote Degree of denominator = degree of numerator: Horizontal asymptote at ratio of leading coefficients. If a rational function has horizontal intercepts at $x = x_1, x_2, \dots, x_n$ and vertical asymptotes at $x = v_1, v_2, \dots, v_m$ then the function can be written in the form x $$f(x) = a\frac{(x-x_1)^{p_1}(x-x_2)^{p_2} \dots (x-x_n)^{p_n}}{(x-v_1)^{q_1}(x-v_2)^{q_2} \dots (x-v_m)^{q_n}}$$