Sec 1.2 Mathematical Models

Linear Models: of the form $f(x) = mx + b$

Example 1: A linear model was made from a set of data relating the year from 1980 to 2002 to the level of carbon dioxide in the atmosphere. From that data a line plot was constructed and a line of regression drawn to give the formula

$$C = 1.55192t - 2734.55$$

Use this model to estimate the average CO_2 level for 1987 (interpolation) and to predict the level for 2010 (extrapolation).

Polynomials: $ax^n + bx^{n-1} , \cdots + c$

Quadratic Function: a poly of degree 2.

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

A ball dropping

Cubic Function: a poly of degree 3.

$$g(x) = x^3 - x^2 + x + 1$$

Power Function: $f(x) = x^a$ where a is constant. *(scrawled handwritten note)*

$$g(x) = x^2, \quad h(x) = x^3, \ldots$$

(If a is even then it is an even function. If a is odd, then it is an odd function.)

Root Function: $f(x) = x^{\frac{1}{n}} = \sqrt[n]{x}$ For even values of n, the domain is $[0, \infty)$. For all odd values of n, the domain is all reals.

Reciprocal Function: $f(x) = x^{-1} = \dfrac{1}{x}$ and is a hyperbola with the coordinate axis as its asymptotes.

What is the difference between the Cubic Function and the Power Function $h(x) = x^3$ **?**

Rational Function: $f(x) = \dfrac{p(x)}{q(x)}, q(x) \neq 0$

$f(x) = \dfrac{2x^4 - x^2 + 1}{x^2 - 4}$, since the denominator cannot equal 0

the domain is

$(x+2)(x-2)$

$x \neq 2, -2$ $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

Algebraic Functions: constructed using algebraic operations. Any rational function is automatically an algebraic function.

Trigonometric Functions: functions defined by sine, cosine, tangent and their inverses as well as reciprocals. *f(x)* = sin *x*

Exponential Functions: $f(x) = a^x$, a is a positive constant.

Logarithmic Functions: (inverse of the exponential functions.) *f(x)*=log$_a$ *x*

Transcendental Functions: All functions that are not Algebraic Functions including trigonometric, inverse trigonometric, exponential, and logarithmic functions. (There are several more types included in this that we have not discussed yet.)

Homework is p 35 (2-4, 8, 11, 15, 17-19)