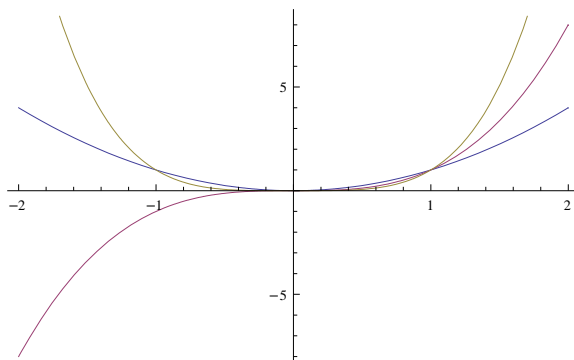


MT 1800 – Calculus I  
Worksheet 1.6 – Power, Polynomial, and Rational Functions

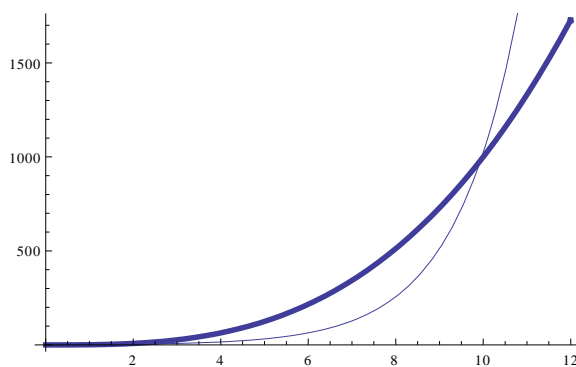
**Power Functions**

A power function is of the form  $f(x) = kx^p$ .

The graphs of  $f(x) = x^2$ ,  $f(x) = x^3$ , and  $f(x) = x^4$  are given below. What do you see?



How do power functions compare with exponential functions? The graphs of  $f(x) = x^3$  (thick graph) and  $f(x) = 2^x$  (thin graph) are shown below. What do you see?



## Polynomials

A polynomial is a sum of power functions with non-negative integer powers. Examples of their graphs are shown on page 38.

Examples:

Some polynomials factor (can be written as product of simpler expressions) and some don't.

Examples:

If a polynomial factors nicely, it's easy to sketch its graph.

Example:  $f(x) = x^3 - 4x$

We can also find a polynomial that has given zeros.

Example: Find a polynomial with zeros at  $x = -1$  and  $x = 2$ .

## **Rational Functions**

A rational function is a fraction of two polynomials.

Example:

A rational function is

- Zero whenever the top is zero.
- Undefined whenever the bottom is zero (we usually get a vertical asymptote at these points).

Example: Sketch the graph of  $f(x) = \frac{x^2 - x}{x^2 - 4}$