Office Hours

Tuesdays 3-4pm
Thursdays 11am-12pm

AP&M 6321

Homework 1

Write answers on separate sheet of paper.
Show your work.

Book Reference

Diagnostic Tests pages xxiv - xxvii (beginning of book)

Appendixes pages A1 - A80 (end of book)

Canvas online Diagnostic Test has instructions in Assignments section of Canvas

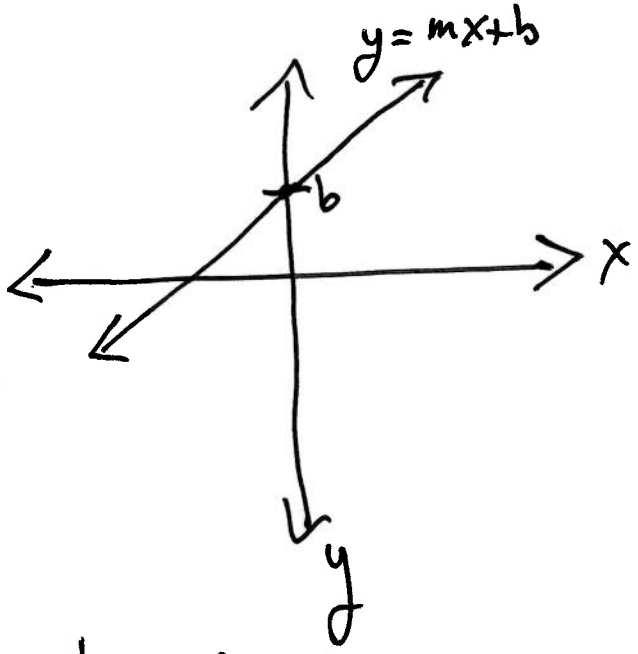
1.2 A Catalog of Essential Functions

Linear Functions

$f(x) = mx + b$ where m and b are constants

m = rate of increase

b = starting point



m = slope of line

b = y-intercept

Polynomials (polys)

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

where $a_0, a_1, \ldots, a_n$ are constants called the coefficients of P, and n is a nonnegative integer.

n = degree of P.

Example: $P(x) = 2x^6 - x^4 - \frac{2}{5}x^2 + \sqrt{2}$

degree of P is 6

coefficients of P are $\sqrt{2}, 0, -\frac{2}{5}, 0, -1, 0, 2$

A poly of degree 1 is a linear function

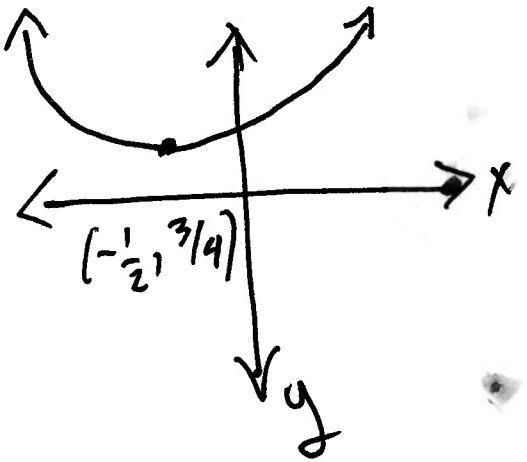
$P(x) = mx + b$, m, b constants

A poly of degree 2 is a called a quadratic function:

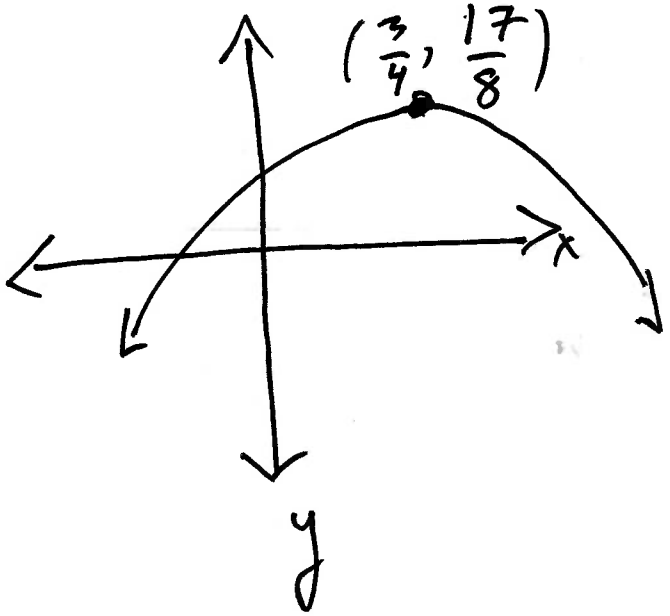
$P(x) = ax^2 + bx + c$, a, b, c constants

The graph of a quadratic function is a parabola.

Examples



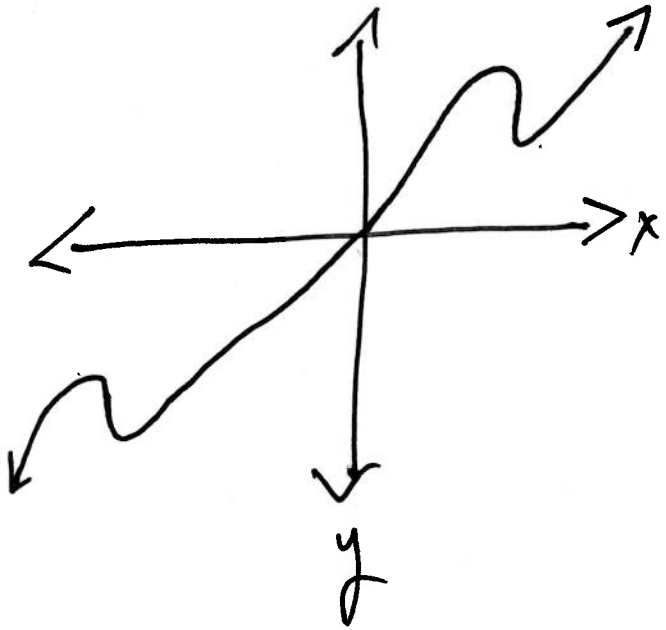
$y = x^2 + x + 1$



$y = -2x^2 + 3x + 1$

The graphs of higher degree polynomials can be complicated.

Ex



$y = 3x^5 - 25x^3 + 60x$

Power Functions

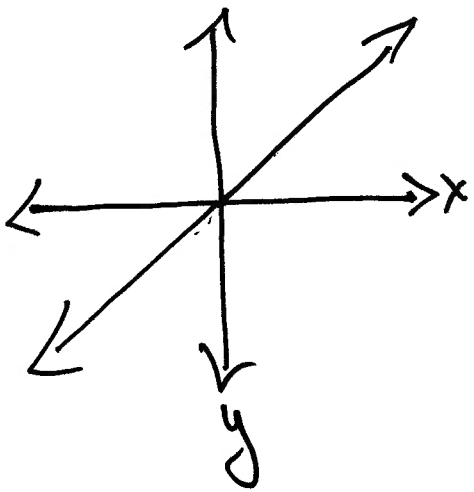
$f(x) = x^a$ where a is a constant

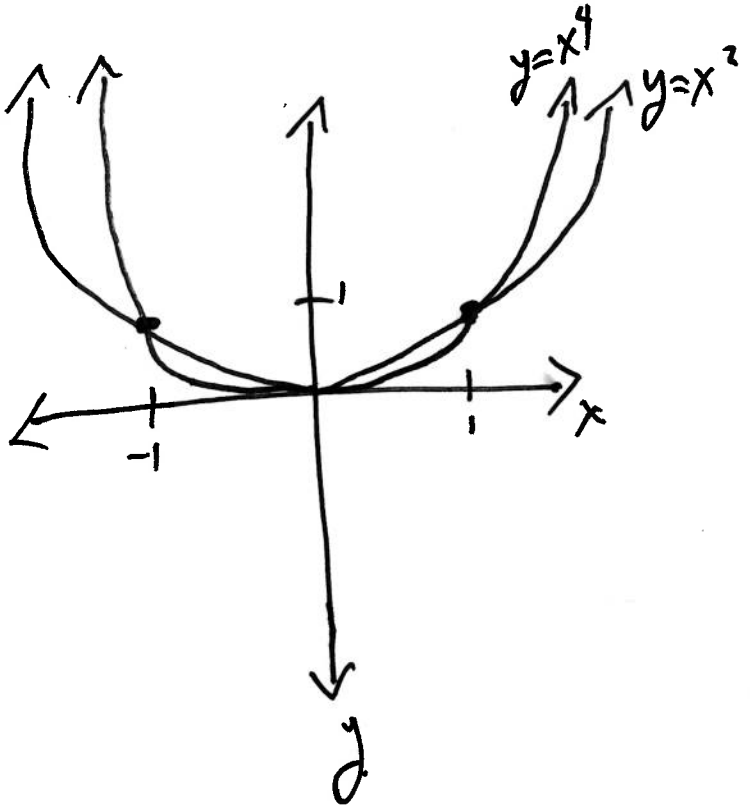
Type 1 $a = n$ where n is a positive integer $n = 1, 2, 3, \ldots$

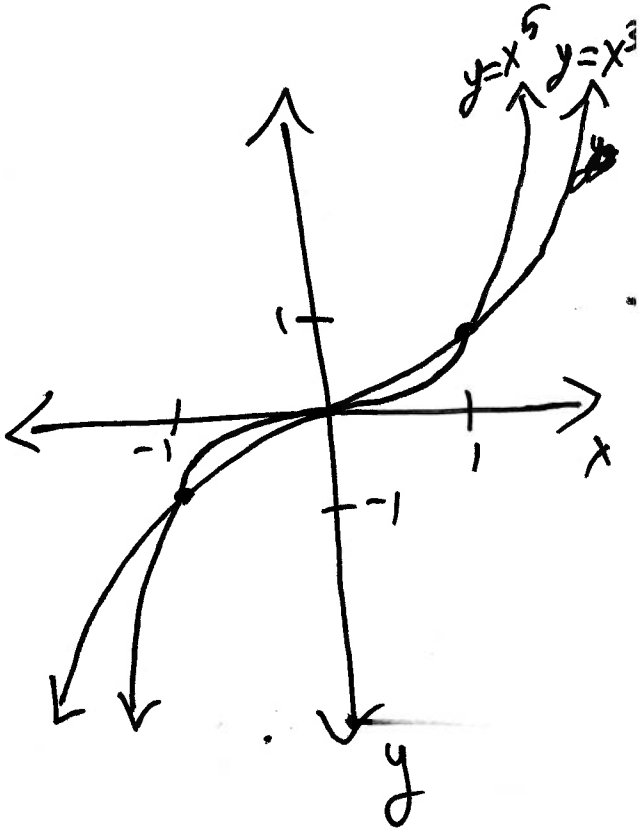
$n = 1$, $y = x$

$n = 2$, $f(x) = x^2$, $n = 3$ $f(x) = x^3$

$n = 4$ $f(x) = x^4$, $n = 5$ $f(x) = x^5$

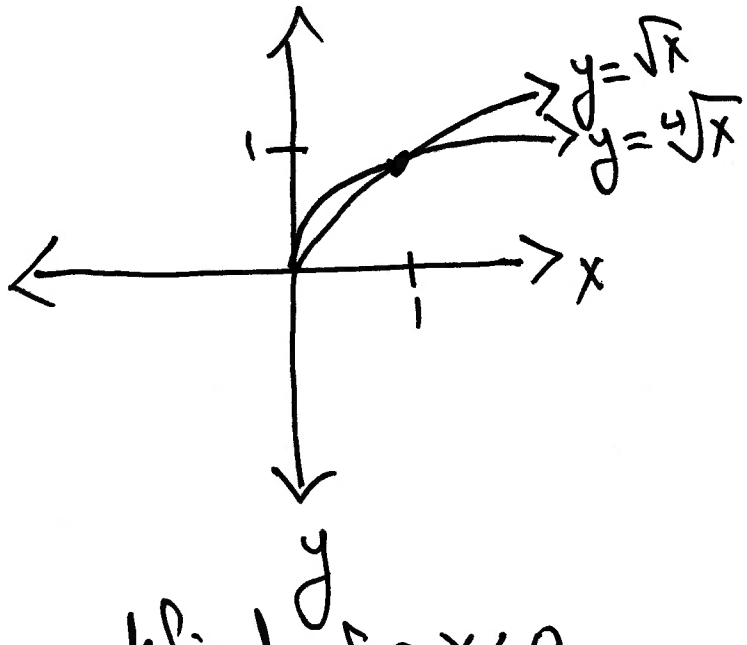






Type 2 $a = 1/n$ where n is a positive integer ≥ 2

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

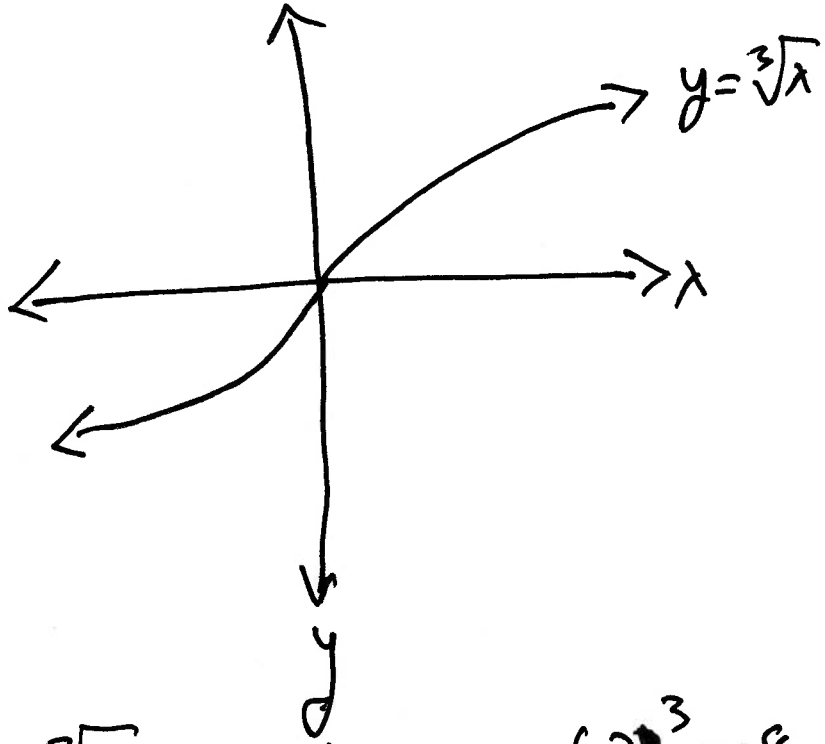


undefined for $x < 0$

$f(-4) = \sqrt{-4}$ does not make sense

not defined.

$n=3$ $f(x) = x^{1/3} = \sqrt[3]{x}$



$f(-8) = \sqrt[3]{-8} = -2$ because $(-2)^3 = -8$

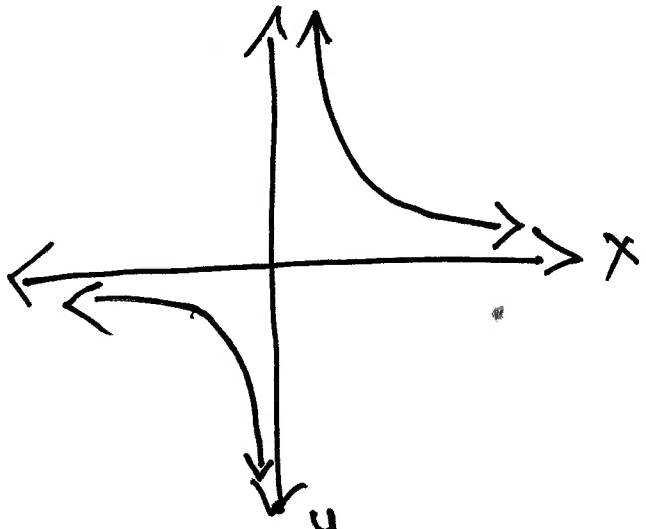
$n=4$, $f(x) = x^{1/4}$

$n=5$ $f(x) = x^{1/5}$

Type 3 $a=-1$, $f(x) = x^{-1} = \frac{1}{x}$

$f\left(\frac{1}{1000}\right) = \frac{1}{1/1000} = \frac{1}{1} \cdot \frac{1000}{1} = 1000$

$f(1000) = \frac{1}{1000}$



undefined at $x=0$

$f\left(-\frac{1}{1000}\right) = \frac{1}{-1/1000} = \frac{1}{1} \cdot -\frac{1000}{1} = -1000$

$f(-1000) = \frac{1}{-1000} = -\frac{1}{1000}$

$f(x) = \frac{1}{x}$ has vertical asymptote y-axis (line $x=0$)
has horizontal asymptote x-axis (line $y=0$)

Rational Functions

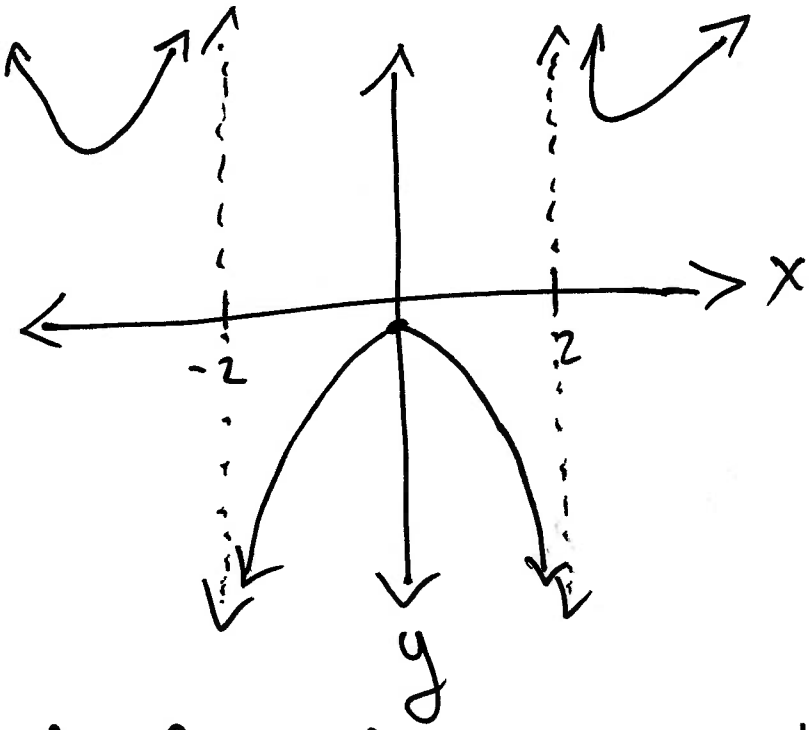
A rational function is a ratio of two polys $f(x) = \frac{P(x)}{Q(x)}$
where P and Q are polys.

Example $f(x) = \dfrac{2x^4 - x^2 + 1}{x^2 - 4}$

denominator $x^2 - 4 = (x-2)(x+2)$

$0 = (x-2)(x+2)$

$x = 2$ or -2



Graphing rational functions is complicated...

Algebraic Functions – anything you can write down using $+, -, \cdot$, division and taking roots

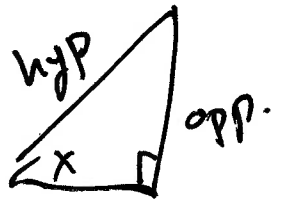
ex $f(x) = \dfrac{\sqrt{x^2+1}}{x^{1/3} + x + 7} + x^{27}$

Exponential Functions — section 1.5

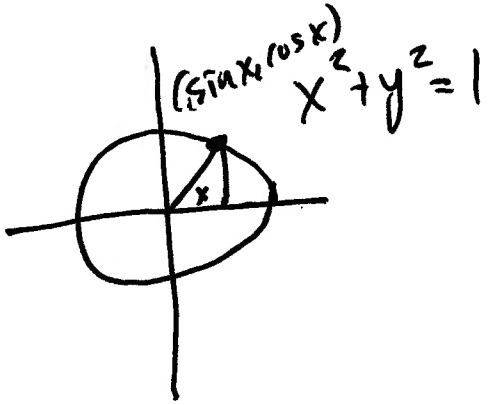
Logarithm Functions — section 1.6

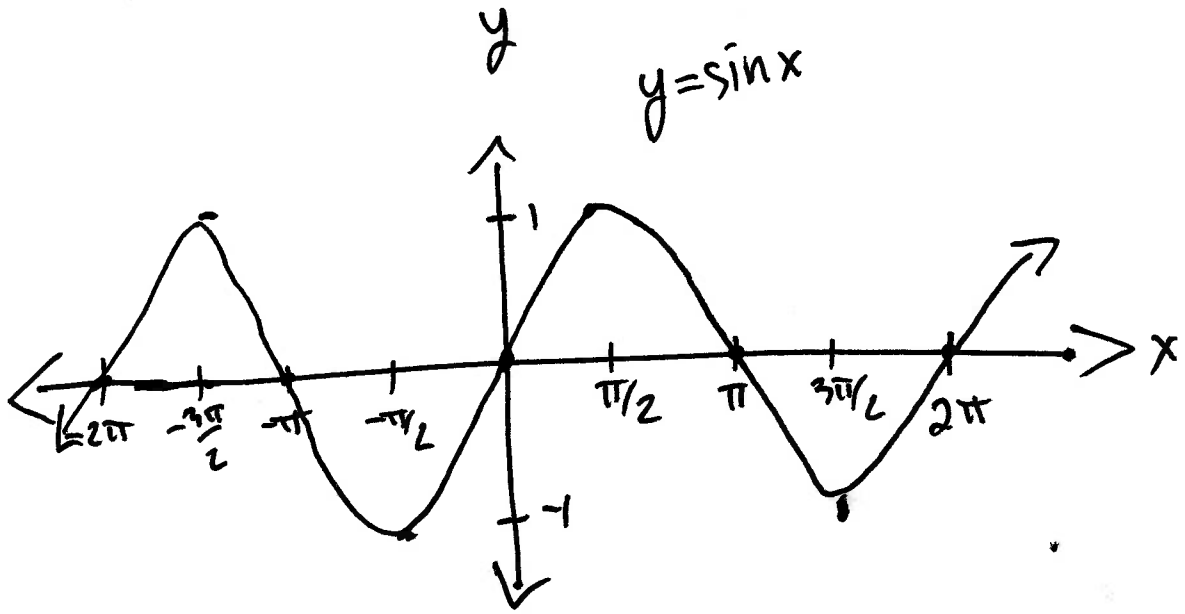
Trig Functions

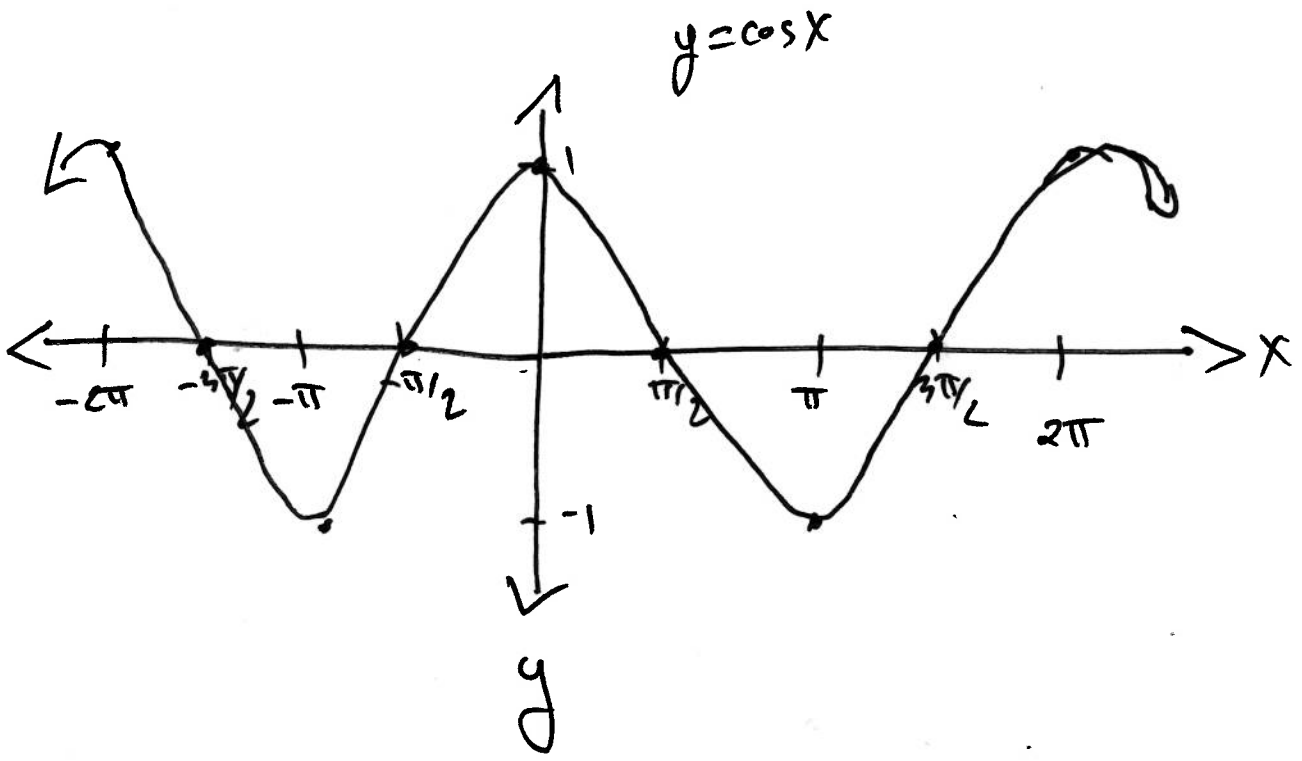
$f(x) = \sin(x)$, $f(x) = \cos(x)$, $f(x) = \tan(x)$



$$\sin(x) = \frac{\text{opp.}}{\text{hyp.}}$$







Inverse Trig Functions — section 3.6