Welcome

Please Sign-In

Day 1

Session 1

Self-Evaluation

Topics to be covered:

- Equations
- Systems of Equations
- Solving Inequalities
- Absolute Value Equations

Equations

Equations

An equation says two things are equal.

To find the equation of a line you need a point and a slope.

Written two ways

- point-slope form $y - y_1 = m(x - x_1)$
- slope-intercept form $y = mx + b$

To solve you must keep both sides balanced.

Equations

Try this:

1.) Find the equation of the line between the points (1,2) and (3,4).

2.) Write the equation in slope-intercept form x+11 = 10y+1

3.) Write in standard form $x^2 + y^2 - 2y = 1$

Systems of Equations

Systems of Equations

A system of equations is when we have two or more equations working together.

The two main ways to solve a system of equations are:

- Substitution
- Elimination

Solving by substitution

The steps are:

1. Choice one of the equations and solve it for a specific variable.
2. Substitute that variable in the other equation(s).
3. Solve the other equation(s).
4. Repeat if needed.

Example: Solving by substitution

Let’s work through an example:

$$3x + 2y = 19$$

$$x + y = 8$$

Solving by elimination

The goal is to eliminate variables in order to solve for each variable.

The two acceptable ways of doing this are multiplying by a non-zero number and adding two equations together.

Systems of Equations

Try these yourself using whichever method you prefer:

1.) $3x+2y=19$

$x+y=15$

2.) $x+y+z=6$

$2y+5z=-4$

$2x+5y-z=27$

Break

Solving Inequalities

Inequalities

Similar to equations you need to keep balance.

You may freely:

- add or subtract a constant
- multiply or divide by a non-negative number

You must swap if you:

- multiply or divide by a negative number
- swap the left and right hand sides

Inequalities

Let’s try this together:

$$3x + 2 > 8$$

Inequalities

Try these:

1.) $-2 < \frac{6-2x}{3} < 4$

2.) $-4 \leq -3x + 2 < 5$

Absolute Value Equations

Absolute Value Equations

Think of Abs. Values as the distance from zero.

Formally $|x| = \begin{cases} x & \text{when } x>0 \\ 0 & \text{when } x=0 \\ -x & \text{when } x<0 \end{cases}$

Within inequalities these have new properties.

Absolute Value Equations

Let try one together:

$$|2x - 3| > 7$$

Absolute Value Equations

Try these yourself:

1.) $|x - 3| < 1$

2.) $\left|\frac{x+1}{4}\right| \geq 4$

Limits

Limits

We can think of a limit as the intended height of the function.

The three first steps to try and evaluate a limit are

1. Plug it in
2. Factor something out
3. Conjugate

When the variable of the limit approaches infinity it is called a limit at infinity.

These types of limits can tell about the end behavior of a graph.

Limits

Let's try these together:

1.) $$\lim_{x \to -2} \frac{x^2 - 4}{x+2}$$

2.) $$\lim_{x \to \infty} \frac{-4x^3 + 7}{2x^2 - 5x + 6}$$

Limits

Try these yourself:

1.) $$\lim_{x \to -6} \frac{2x^2 + 13x + 6}{x + 6}$$

2.) $$\lim_{x \to \infty} \frac{x^2 + 5x - 2}{x}$$

Inverse Trig

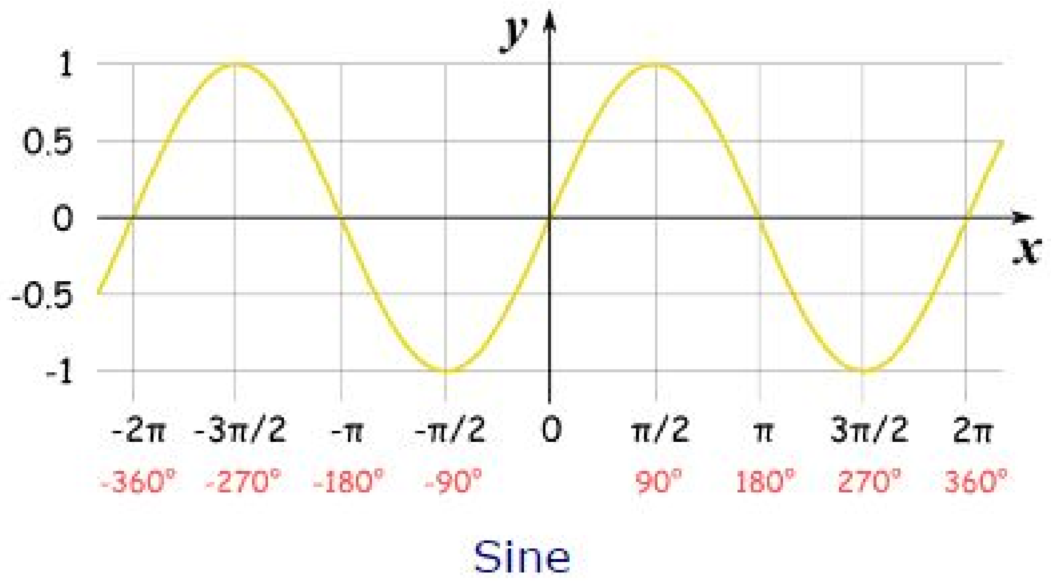
Inverse Trig

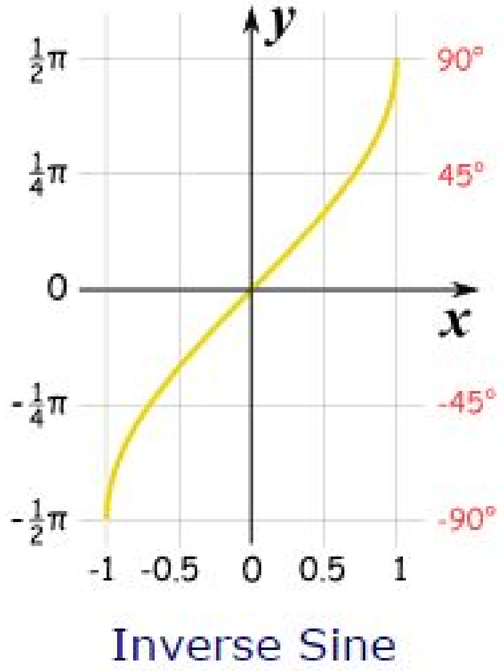
An inverse trig function reverses the action of evaluating a trig function, and gives back you angle.

The three main inverse trig functions are:

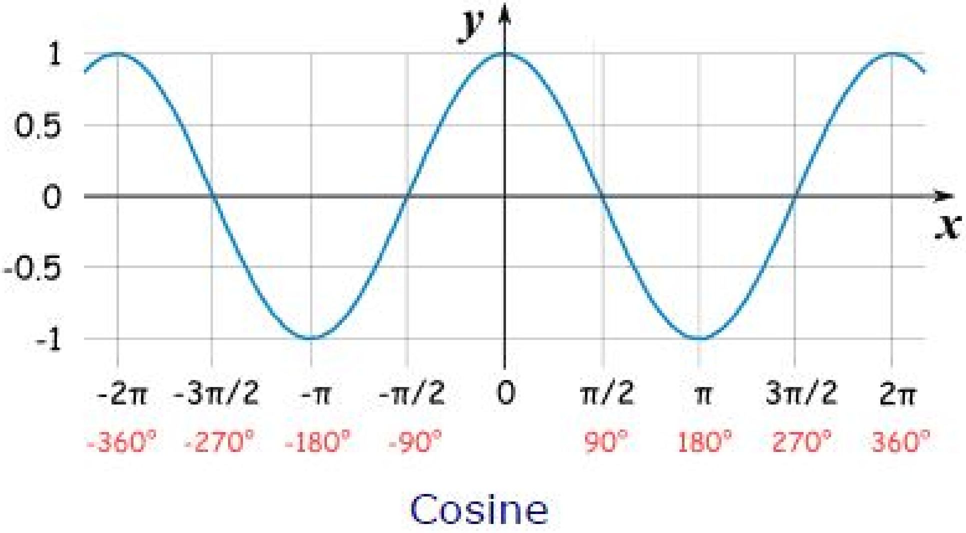
- Inverse Sine $\sin^{-1}$ or $\arcsin$
- Inverse Cosine $\cos^{-1}$ or $\arccos$
- Inverse Tangent $\tan^{-1}$ or $\arctan$

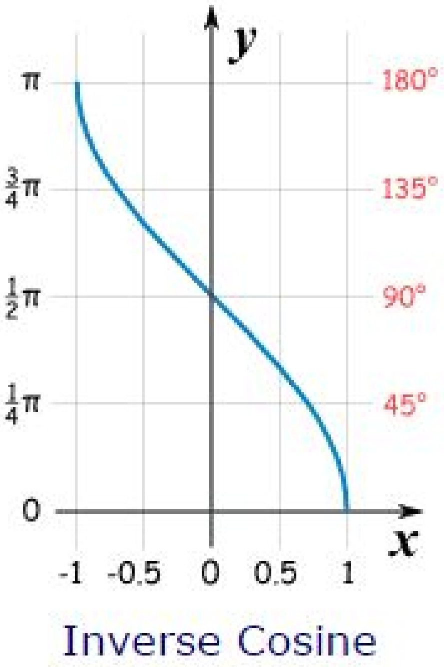
Inverse Trig Graphs



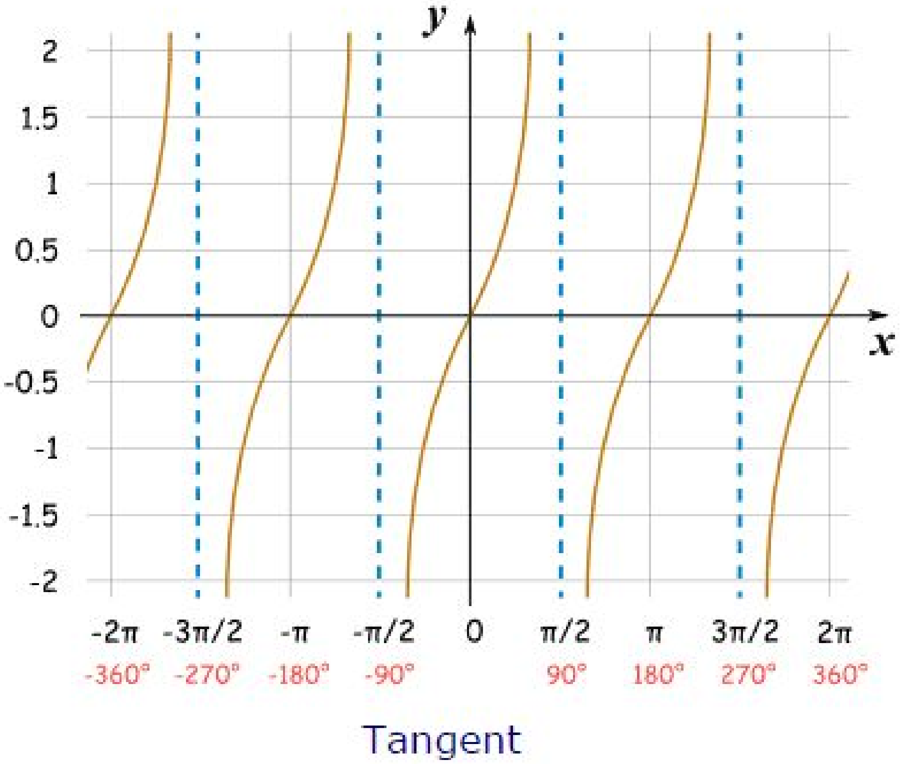


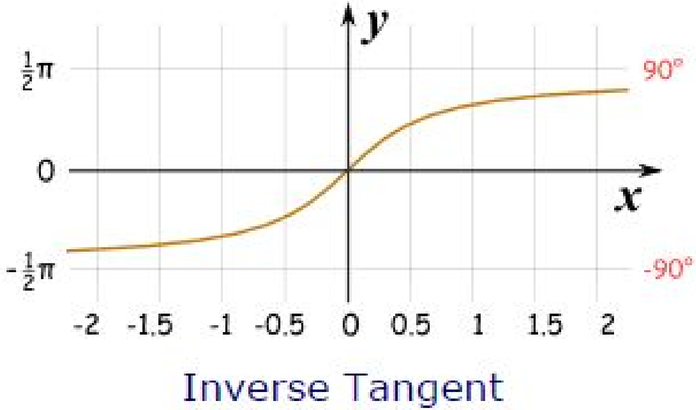
The Sine and Inverse Sine Graphs





The Cosine and Inverse Cosine Graphs





The Tangent and Inverse Tangent Graphs

Inverse Trig

Evaluate:

1.) $\sin^{-1}\left(\frac{1}{2}\right)$

2.) $\arctan(1)$

3.) $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

Inverse Trig

Evaluate:

1.) $\cos\left(\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right)$

2.) $\cos^{-1}\left(\cos\left(7\times\frac{\pi}{6}\right)\right)$

3.) $\cos^{-1}(\sqrt{2})$

Notation

Notation

- Interval
- Set (Builder)
- Equal signs
- Arrows

Questions?

Welcome Back!

If you haven't signed in yet please do so.

DAY 1

Session 2

Self Evaluation

Topics to be covered:

- Exponents
- Logarithms
- Radicals
- Rationalizing

EXPONENTS:

EXPONENTS:

The exponent of a number says how many times to use it in a multiplication.

Also know as powers and indices.

$$\chi^2$$

Exponents:

Let’s try one together:

$$x^0 \bullet (x^2)^3 \div (x^2 \bullet x^{1/2})$$

Exponents:

Try these yourself:

1.) $(x^3 \div x^{1/2}) \bullet (x^{3/2} \div x^0) \bullet x^7$

2.) $(x+1)^{-1}x^3 + (x-4)^{-2}2x$

Exponents

Let’s try some more:

$$\left(\frac{x^{2}y^{-1}}{x^{-3}y^{2}}\right)^{-4}$$

$$\frac{4x^{-3}y^{4}z^{6}}{12x^{2}y} \div \left(\frac{5xy^{-1}}{15x^{3}z^{-2}}\right)^{2}$$

Exponentials

&

Logarithms

Exponentials and Logarithms

Exponentials move the variable up to the power.

Logarithms undo exponentials.

Logarithms

Let’s try some together:

1.) Simplify $\log 2 + \log 11 + \log 7$

2.) Expand $\log\left(\frac{6}{5}\right)^6$

Logarithms

Try these yourself:

1.) Solve $2log_5(x) = 10$

2.) Simplify $3\ ln(x^2) + 9ln(x) - 7ln(3x + 2)$

Logarithms

Try some more:

$$\log_2\left(x^2-6x\right)-\log_2\left(1-x\right)=3$$

$$\log_4\left(3x-2\right)=2$$

Break

Radicals

Radicals

Radicals work in the opposite way as exponents.

The bottom number in a fractional power is the root.

Think of a tree.

Radicals

Let's try this one together:

$$\left(\frac{16}{81}\right)^{5/4}$$

Radicals

Try these yourself:

1.) Evaluate $\sqrt[4]{625}$

2.) Evaluate $\left(\sqrt[3]{\frac{125}{216}}\right)^2$

Radicals

Try some more:

$$\sqrt[3]{16x} - \sqrt[3]{54x^4}$$

Rationalizing

Rationalizing

We do not want to have the crazy guy in the basement.

To fix this we need to use conjugates.

Conjugates will also be helpful later on when you learn about limits.

Rationalizing

Let’s try this together:

Rationalize the denominator $\dfrac{9}{2\sqrt{7}-1}$

Rationalizing

Try these yourself:

1.) What is the result of multiplying (3−2x) by its conjugate?

2.) Rationalize the denominator $\frac{2}{5+\sqrt{3}}$

Study Tips

What can you do before the semester starts:

- Be proactive
- Review the self-evaluation
- Explore online resources
- Talk to your professor
- Find out what resources are available on campus
- Form a study group

Throughout the semester

- Go to class
- Stay on top of homework
- Go to office hours, CAPS, calc table

Questions?

Welcome

Please Sign-In

DAY 2

Session 1

Self-Evaluations

Topics to be covered:

- Polynomials
- Long Division
- Common Graphs
- Graphing

Polynomials

Polynomials:

Polynomial comes from poly- (meaning many) and -nomial (meaning here term). “Many Term”

Can have:

- constants
- variables
- exponents

Polynomials:

Let's try this together:

graph: $p(x) = -4(x-2)^2(x+5)^3$

Polynomials:

Try these for yourself:

1.) factor: $x^3 - 5x^2 + 3x - 15$

2.) Expand y = (3a-4b+1)(2a+5b-3)

3.) Show that a polynomial P(x) that contains only odd powers of x is odd.

4.) Construct a polynomial of degree seven with zeroes

at x=1, x=-2, and x=3, then graph.

Long Division

Long Division

Let’s try one together:

$$\frac{5x^3+3x^2+8x-8}{5x-2}$$

Long Division

Try these yourself:

1.) $$\frac{2y^3 - y^2 - 13y + 9}{y - 2}$$

2.) $$\frac{x^2 - 4}{x + 2}$$

Long Division

Try these yourself:

1.) $$\frac{2x^5 + 4x^4 - 4x^3 - x - 3}{x^2 - 2}$$

Break

Common Graphs

Common Graphs

Linear

Parabola

Square Root

Cubic

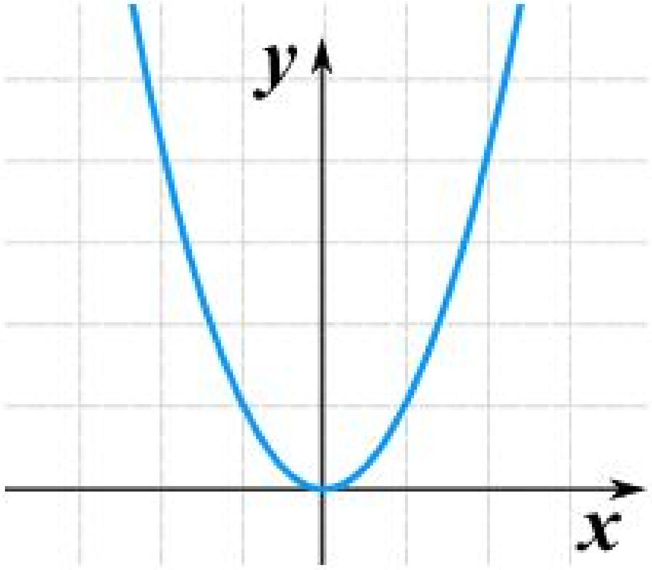
Cube Root

Absolute Value

Exponential

Logarithmic

Trigonometric



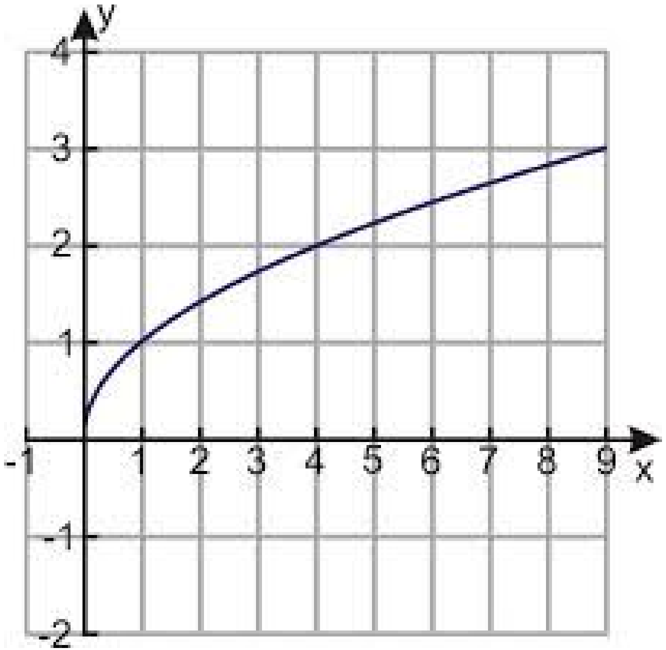
Parabola

$$y = x^2$$

domain: $(-\infty, \infty)$

range: $[0, \infty)$

even



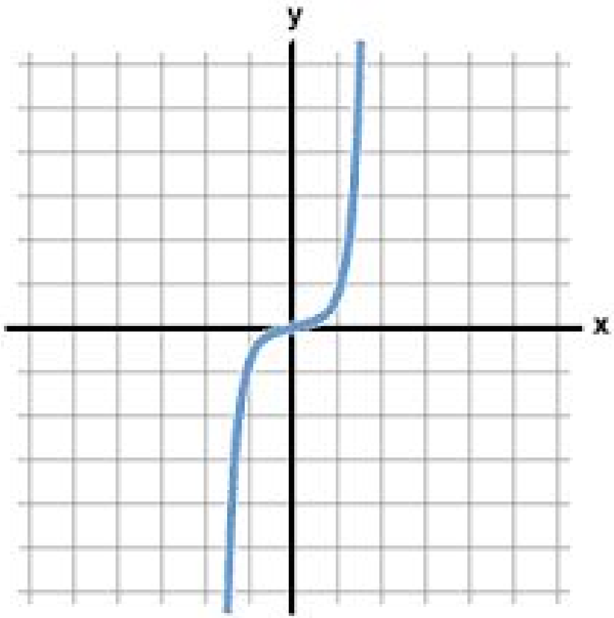
Square Root

$$y = \sqrt{x}$$

domain:[0,∞)

range:[0, ∞)

neither



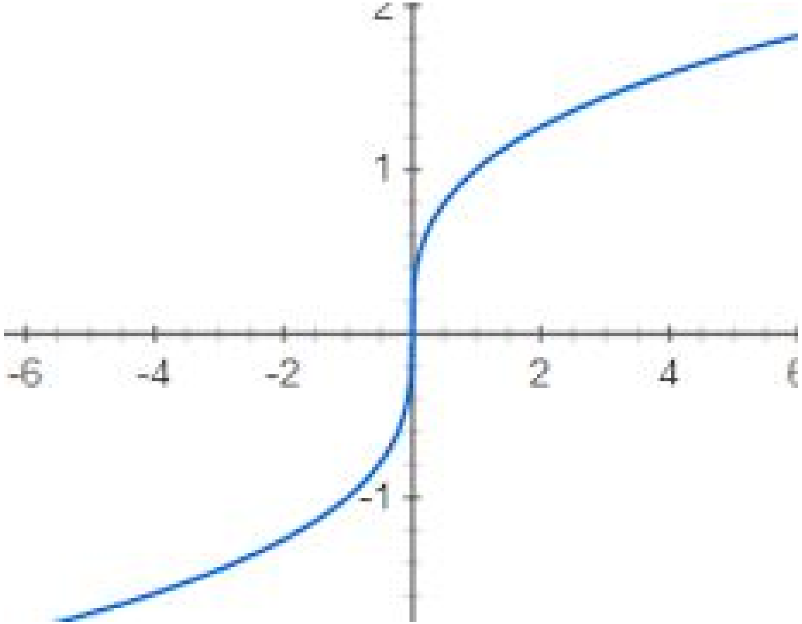
Cubic

$$y = x^3$$

domain: $(-\infty, \infty)$

range: $(-\infty, \infty)$

odd



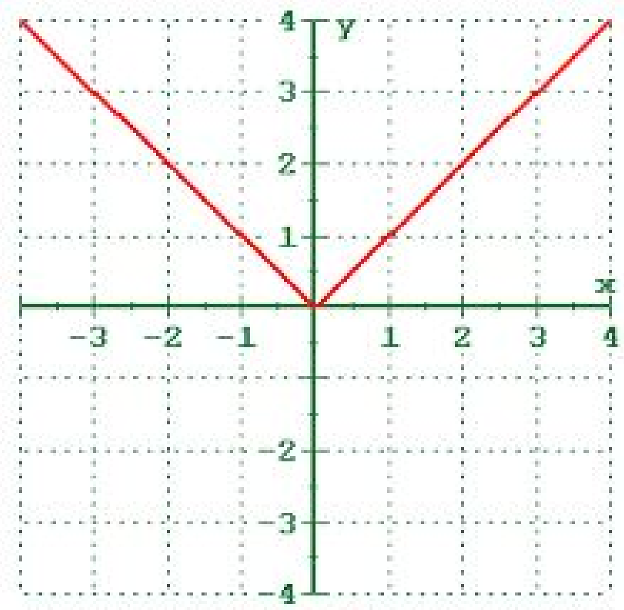
Cube Root

$$y = \sqrt[3]{x}$$

domain:(−∞,∞)

range:(−∞,∞)

neither



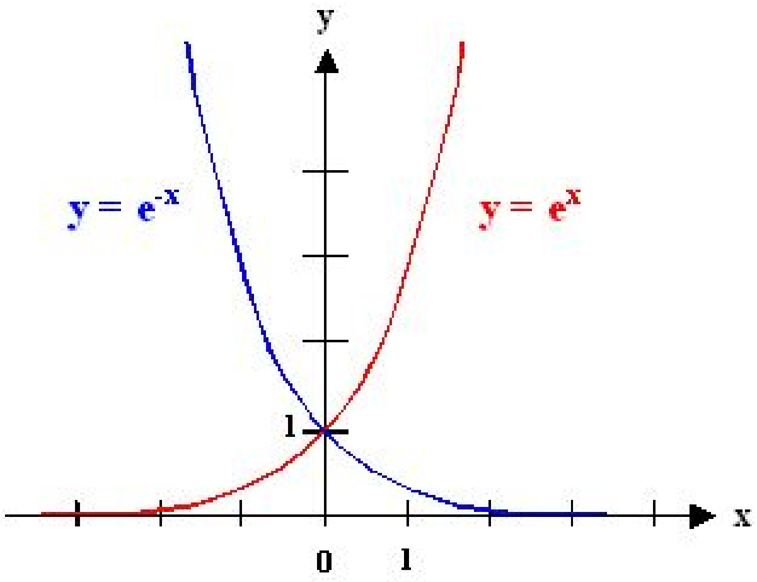
Absolute Value

$$y = |x|$$

domain: $(-\infty, \infty)$

range: $[0, \infty)$

even



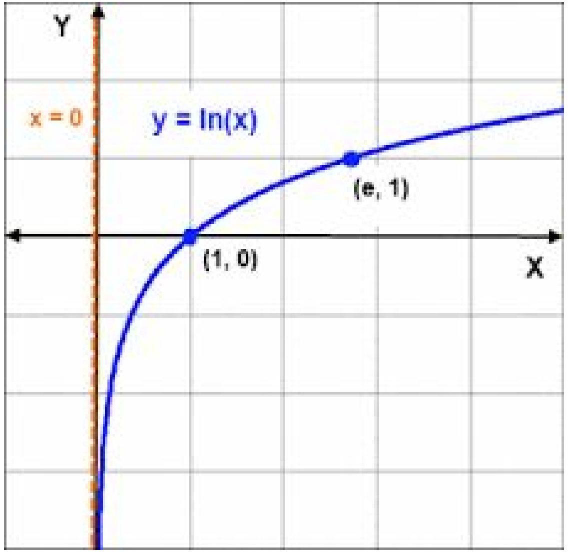
Exponential

$$y = e^x$$

domain: $(-\infty, \infty)$

range: $(0, \infty)$

neither



Logarithm

$$y = ln(x)$$

domain:$(0,\infty)$

range:$(-\infty,\infty)$

neither

Transformations

$y = f(x) + C$	• $C > 0$ moves it up • $C < 0$ moves it down
$y = f(x + C)$	• $C > 0$ moves it left • $C < 0$ moves it right
$y = Cf(x)$	• $C > 1$ stretches it in the y-direction • $0 < C < 1$ compresses it
$y = f(Cx)$	• $C > 1$ compresses it in the x-direction • $0 < C < 1$ stretches it
$y = -f(x)$	• Reflects it about x-axis
$y = f(-x)$	• Reflects it about y-axis

Graphing

Graphing

- Intercepts
- Domain
- Range
- Positive/Negative
- Degree of zero(s)
- Even Odd

Quadratics

- Vertex
- Increase/Decrease

Rationals

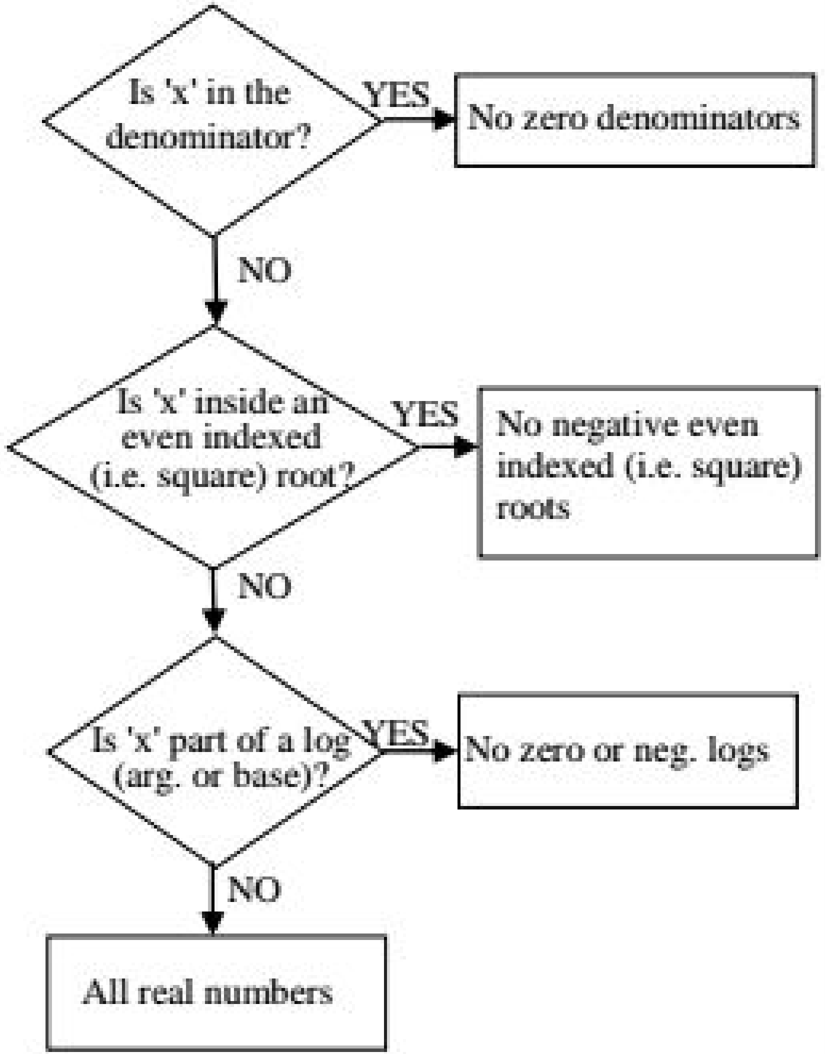
- Asymptotes (& holes)

Others

- Transformations

Graphing

- Domain



Graphing

Let's try graphing this:

$$\frac{x^2-4}{x+2}$$

Graphing

Try graphing these yourself:

1.) $f(x) = 2x^2 + 8x - 12$

2.) $f(x) = |x + 32| - 9$

Questions?

Day 2

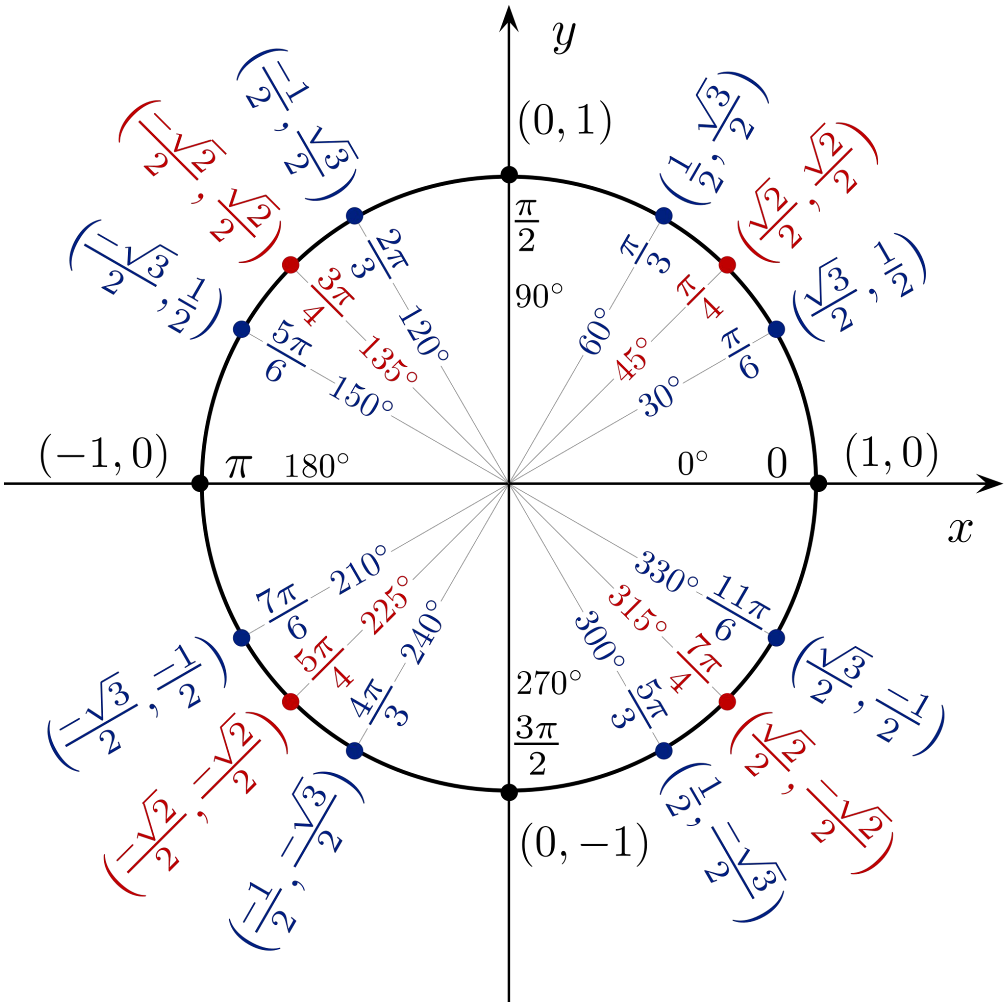
Session 2

Self-Evaluations

Topics to be covered:

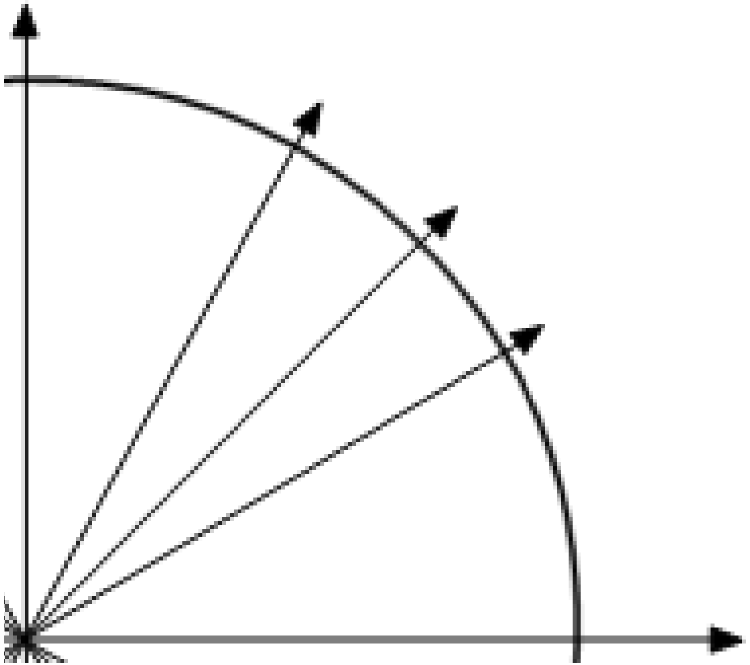
- The Unit Circle
- Graphs of Trig Functions
- Evaluating Trig Functions
- Trig Formulas
- Solving Trig Equations

The Unit Circle



y
x
(0, 1)
(1, 0)
(−1, 0)
(0, −1)
π/2
90°
π/3
60°
π/4
45°
π/6
30°
0°
0
2π/3
120°
3π/4
135°
5π/6
150°
π
180°
7π/6
210°
5π/4
225°
4π/3
240°
270°
3π/2
5π/3
300°
7π/4
315°
11π/6
330°
(1/2, √3/2)
(√2/2, √2/2)
(√3/2, 1/2)
(−1/2, √3/2)
(−√2/2, √2/2)
(−√3/2, 1/2)
(−√3/2, −1/2)
(−√2/2, −√2/2)
(−1/2, −√3/2)
(1/2, −√3/2)
(√2/2, −√2/2)
(√3/2, −1/2)

Constructing the Unit Circle



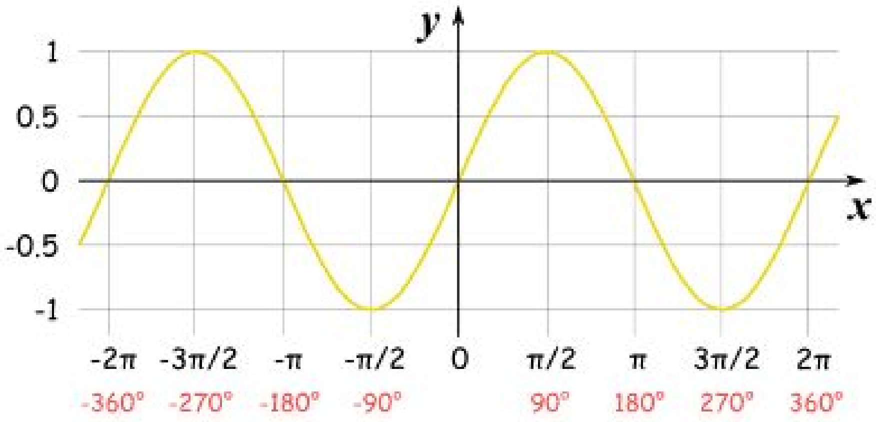
- Angles
- Focus on the first quadrant
- Count to 4
- Square root and divide by 2
- Know the signs

Graphs of Trig Functions

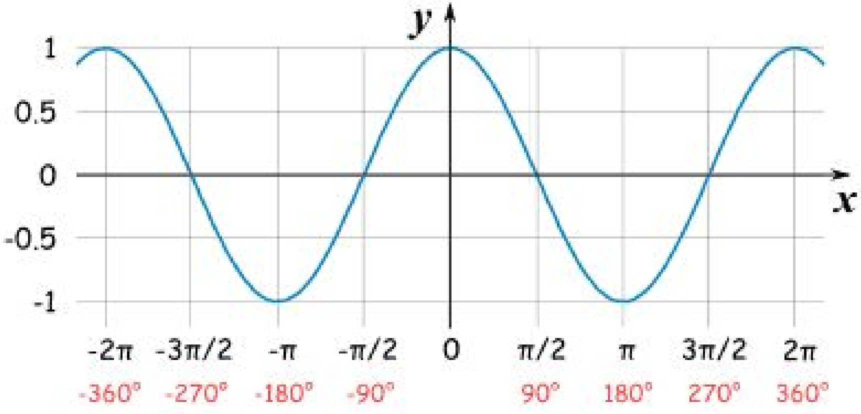
Graphs of Trig Functions

The main points of a trig graph are:

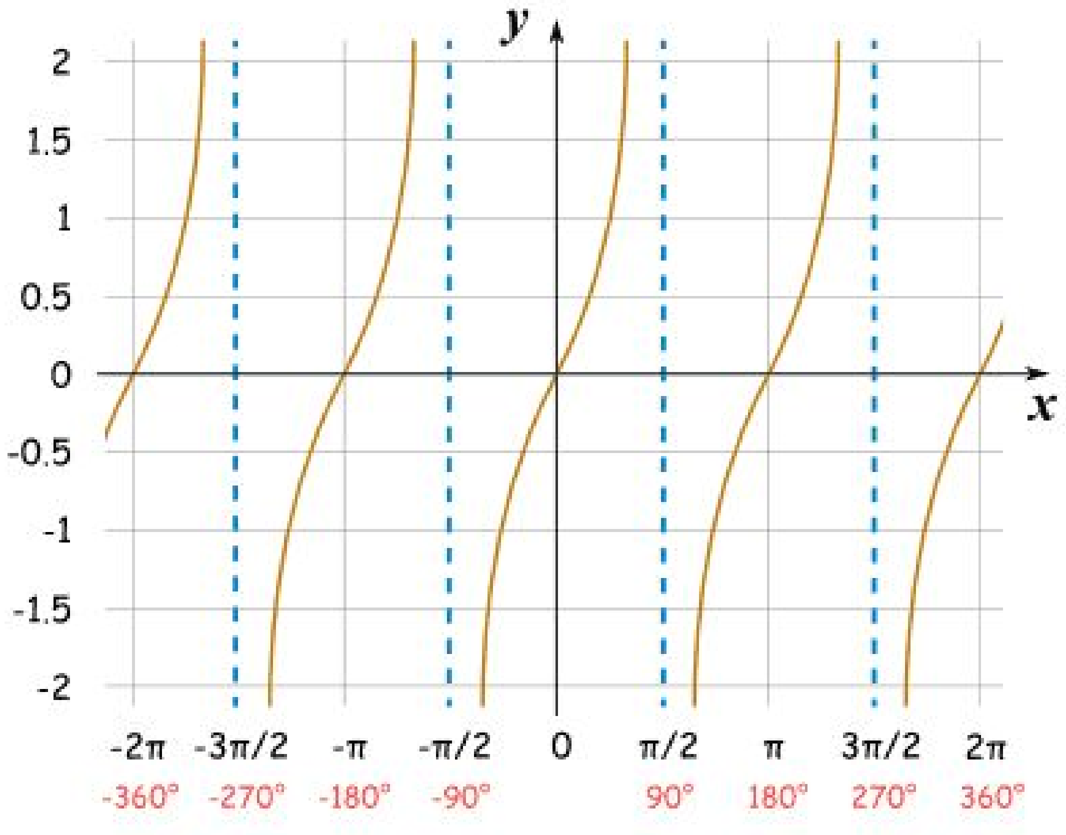
- Period
- Phase Shift
- Amplitude (sin and cos)
- Asymptotes (tan)



Sine



Cosine


y
x
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2π
-3π/2
-π
-π/2
0
π/2
π
3π/2
2π
-360°
-270°
-180°
-90°
90°
180°
270°
360°

Tangent

Graphs of Trig Functions

Let's try graphing this together:

1.) $f(x) = -3 \sin(\pi x + \pi/2)$

2.) $f(x) = \text{Abs}(\sin(x))$

Evaluating Trig

Evaluating Trig Functions

The three main trig functions are sin, cos, and tan.

They will come up in Calc and later math.

The more you know them now the easier it will be later.

- Unit circle
- Consider the graphs
- Look for tricks

Break

Trig Formulas

Trig Formulas

$$\sin^2 x + \cos^2 x = 1$$

Power reduction

Sum and difference

Pythagorean Identities

Trig Formulas

Let’s try some together:

Write in only first powers of cosine $cos^4(2x)$

$sinA = \frac{15}{12}$. $cosA = \frac{8}{17}$, $sinB = \frac{5}{13}$, $cosB = \frac{12}{13}$

What is the exact value of $sin(A+B)$?

Trig Formulas

Try these yourself:

1.) Find the value of the other five trig function values on the unit circle, given that

$sin\theta = \frac{3}{5}$ and θ is acute

2.) $tan(\theta) = x, \theta$ *is in Quadrant* 1. *What is* $sin(\theta)$?

Trig Formulas

Try these yourself:

1.)Show that

$$\frac{\sin(x) - 1}{\sin(x) + 1} = -\frac{\cos^2(x)}{(\sin(x) + 1)^2}$$

2.) Show that

$$\frac{\sec(t) - \cos(t)}{\sec(t)} = \sin^2(t)$$

Trig Formulas

Try these yourself:

1.) Write sin(x) in terms of sec(x) where x is in quadrant I

2.) Write tan(x) in terms of cos(x) where x is in quadrant II

Solving Trig Equations

Solving Trig Equations

Start working like any other equation.

Rearrange using trig formulas if needed.

Finish by evaluating the trig functions.

Remember periodicity!

Solving Trig Equations

Let's try one together:

Solve

$$\log_3(2\sin(x)) = 0$$

Solving Trig Equations

Try these for yourself:

1.) Solve for x $$sin(\frac{x}{2}) = cos(\frac{x}{2})$$

2.) $$\ln(2 - sin^2(x)) = 0$$

Solving Trig Equations

Try these for yourself:

1.) Solve for x: $$4\cos^2(x) - 4\cos(x) + 1 = 0$$

2.) Solve for x: $$\sec^2(x) - 2 = 0$$

Solving Trig Equations

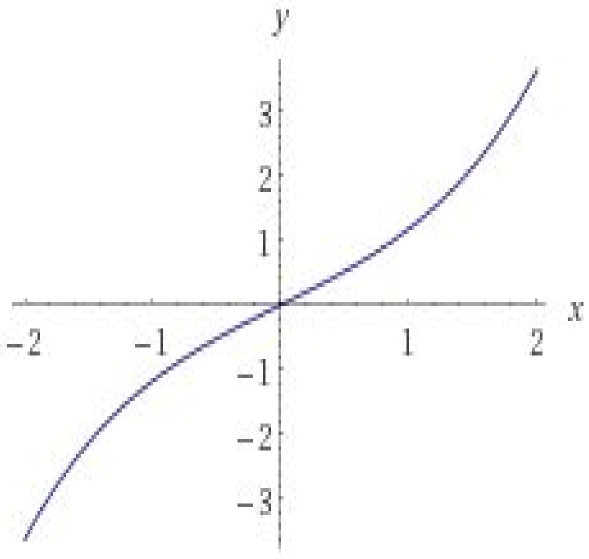
Try these for yourself:

1.) Solve for x:

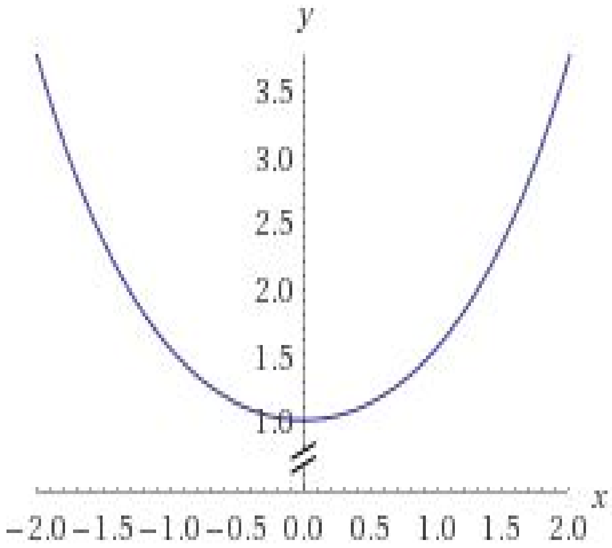
$$\frac{1+\sin x}{\cos x} + \frac{\cos x}{1+\sin x} = 4$$

Hyperbolic trig

Hyperbolic sine:



Hyperbolic cosine:



Hyperbolic trig

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

Questions?