Pre-Calc AB

Lesson 66

12/4/15

Agenda: 12/4/15
Lesson 66
Formulas for Systems of Equ.
Phase Shifts and Period Changes

★ Handout WS 23

- Order of operations, multiplication then addition, thus arguments in a function must be factored

Ex. $f(-x+4) = f(-(x-4))$

Unfactored arguement — factored argument

- reflect about y-axis
- then shift right 4

General forms of Sine and Cosine:

$$f(\theta) = A + B\sin C(\theta - D) \quad \text{and} \quad f(\theta) = A + B\cos C(\theta - D)$$

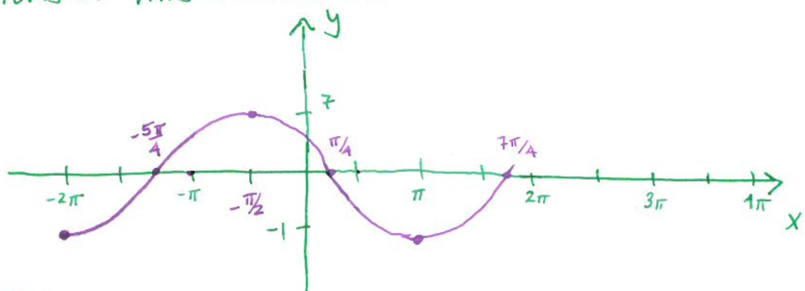
Central line : $y = A$ [Average value of the function]

Amplitude : $|B|$ [max: $A + |B|$ min $A - |B|$]

Phase Shift : $D = \theta$ [where Sine function is average value, Cosine function max or min]

Period : $2\pi / c$ [1 cycle of the graph]

Ex. Write both Sine and Cosine equations of this Sinusoid:



Central line : $y = 3$

Amplitude : 4

Period : $3\pi = 2\pi/c \Rightarrow c = 2/3$

$y = 3 + 4\sin\frac{2}{3}\left(x + \frac{5\pi}{4}\right)$ or $y = 3 - 4\sin\frac{2}{3}\left(x - \frac{\pi}{4}\right)$

$y = 3 + 4\cos\frac{2}{3}\left(x + \frac{\pi}{2}\right)$ or $y = 3 - 4\cos\frac{2}{3}(x + \pi)$

Pre-Calc AB — Lesson 67, part 68 — 12/7/15

Agenda: 12/7/15
- lesson 67, part 68
  - Antilogarithms
  - locus def of a parabola
  - Derivation

★ Handout Test 8 Study Guide

★ HW67!

Recall: The exponent is the logarithm and the number is the antilogarithm

$$\log_b N = L \iff b^L = N$$

Ex. 67.1 If the base is 2, find the antilogarithm of 4.63

$$N = 2^{4.63} \approx \boxed{24.76}$$

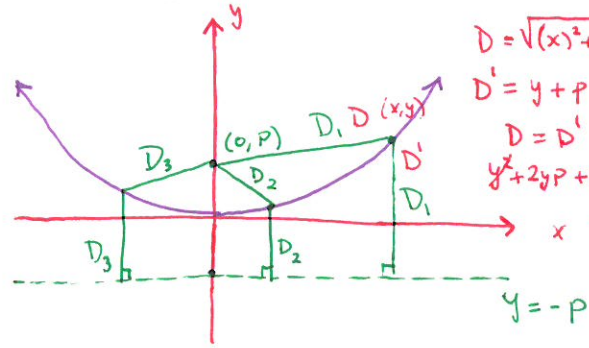
Ex. 67.3 Use a calculator to find the base e antilogarithm of 4.63

$$N = e^{4.63} \approx \boxed{102.51} = \text{antilog}_e(4.63)$$

Recall: A line is the locus of all points equidistant from two designated points.
A circle is the locus of all points equidistant from the center of the circle.

A parabola is the locus of all points equidistant from a given point, the focus, and a given line, the directrix.

$$\boxed{\begin{array}{l} \text{Form: } y = \frac{1}{4p}x^2 \\ \text{focus: } (0, p) \\ \text{Directrix: } y = -p \end{array}}$$



$D = \sqrt{(x)^2 + (y-p)^2}$

$D' = y + p$

$D = D'$

$\cancel{y^2} + 2yp + \cancel{p^2} = x^2 + \cancel{y^2} - 2yp + \cancel{p^2}$

$4yp = x^2$

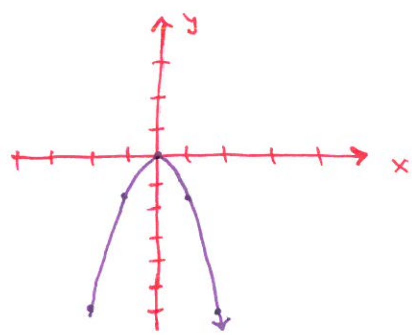
$\boxed{y = \frac{1}{4p}x^2}$

Ex. 68.1 Find the coordinates of the focus and the equation of the directrix for the parabola $y = \frac{3}{7}x^2$.

$$y = \frac{4 \cdot 3}{4 \cdot 7}x^2 = \frac{1}{4\left(\frac{7}{12}\right)}x^2 \qquad \boxed{\text{Focus: } \left(0, \tfrac{7}{12}\right) \quad \text{Directrix: } y = -\tfrac{7}{12}}$$

Ex. Find the equation of the parabola with its vertex at the origin and focus $\left(0, -\frac{1}{6}\right)$. Graph.

$$y = \frac{1}{4\left(-\frac{1}{6}\right)}x^2 = \boxed{-\frac{3}{2}x^2}$$



Lesson 68

Pre-Calc AB 12/8/15

Agenda: 12/8/15

Lesson 68

Translated parabolas, Derivation, Applications

- Test 8 tomorrow

Equation of translated Parabola (Standard form)

Equation of Graph of $y = ax^2$ translated h units horizontally and k units vertically is:

$$\boxed{y - k = a(x-h)^2 \quad \text{or} \quad y = a(x-h)^2 + k}$$

Rewriting: $y - k = \frac{1}{4p}(x-h)^2$

Vertex: (h, k)

Focus: $(h, k+p)$

Axis of Symmetry: $x = h$

Directrix: $y = k - p$

Ex. 68.3 Write the equation of the parabola with vertex $(-2, 1)$ and focus $(-2, -1)$.

Axis of Symmetry: $\boxed{x = -2}$

Directrix: $\boxed{y = 3}$

$p = -2$

$k = 1$

$k + p = -1$

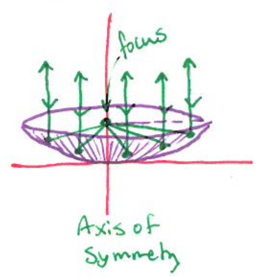
$$\boxed{y - 1 = \frac{1}{-8}(x+2)^2}$$

Applications:

Parabolic reflectors - telescopes, microwave antennae, seachlights, optical lenses.

shape - parabola revolved about its axis of symmetry

Waves or rays coming in parallel to the axis of symmetry will reflect to the focus, whereas outgoing rays from the focus will reflect parrallel to the axis of symmetry.



Ex 68.4 The reflecting surface of a parabolic antenna has the shape formed when the parabola $y = \frac{1}{20}x^2$ is rotated about its axis of symmetry. If measurements are in feet, how far from the vertex should the receiver be placed to be at the focus?

$$y = \frac{1}{20}x^2 = \frac{1}{4 \cdot 5}x^2$$

Thus the focus is 5 feet above the vertex which is where the receiver should be placed.

Pre-Calc AB

Lesson 69

12/10/15

Agenda: 12/10/15
Lesson 69
Matrices
Determinates

★ Handout WS 24

★★ Bring Your Graphing Calculator Tomorrow!

A **matrix** is a rectangular array of numbers or symbols that stand for numbers.

The individual entries of a matrix are called **elements**. The **dimensions** of a matrix is the number of rows by columns.

Ex:

(A) $\begin{bmatrix} 4 & 7 & 5 \\ 2 & 3 & 5 \end{bmatrix}$ (B) $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ (C) $\begin{bmatrix} 0 \end{bmatrix}$ (D) $\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$

(A) 2×3 matrix (B) 3×1 matrix (C) 1×1 matrix (D) 3×3 matrix

- Two matrices are equal if they are the same dimensions and have the same entries in the same positions.
- Two matrices of the same dimensions are added entrywise. $\begin{bmatrix} 1 & 3 \\ -1 & 0 \end{bmatrix} + \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 1+2 & 3+0 \\ -1+1 & 0+3 \end{bmatrix} = \begin{bmatrix} 3 & 3 \\ 0 & 3 \end{bmatrix}$
- Scalar multiplication of a matrix is multiplication of each entry by the scalar.
- A square matrix has the same number of rows and colums. $2\begin{bmatrix} 1 & 3 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 6 \\ -2 & 0 \end{bmatrix}$

Every square matrix has an associated real number – the Determinate

★ If a matrix is not square then it doesn't have a determinate.

Notation: $\left|\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right|$ or $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ or $\det\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \boxed{ad - bc}$

Ex. Evaluate : $\begin{vmatrix} -7 & 3 \\ -5 & -4 \end{vmatrix} = (-7)(-4) - (-5)(3) = 28 + 15 = \boxed{43}$

Ex 69.4 Find x : $\begin{vmatrix} x+4 & 5 \\ 3 & x+2 \end{vmatrix} = -5$

$(x+4)(x+2) - 5(3) = -5$

$x^2 + 6x - 2 = 0$

$x = \dfrac{-6 \pm \sqrt{36 - 4(-2)}}{2}$

$\boxed{x = -3 \pm \sqrt{11}}$