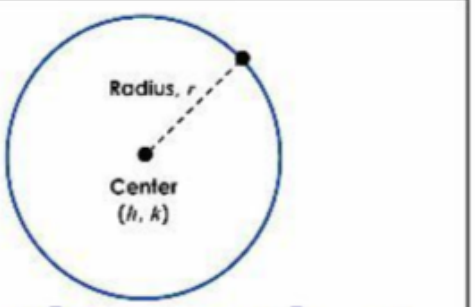
PreCalculus

The Nitty-Gritty for the Midterm ...

PreCalculus - Conic Sections

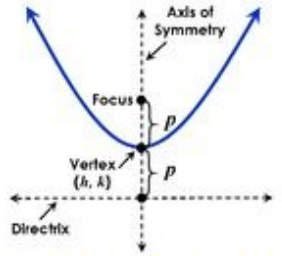
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

CIRCLE



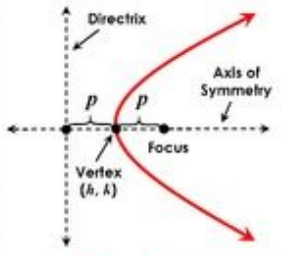
$$(x-h)^2 + (y-k)^2 = r^2$$

PARABOLA



$$(x-h)^2 = 4p(y-k)$$

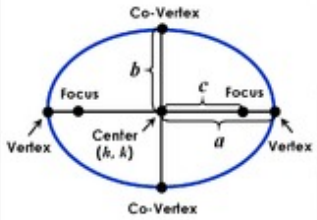
Opens UP if $p > 0$
Opens DOWN if $p < 0$



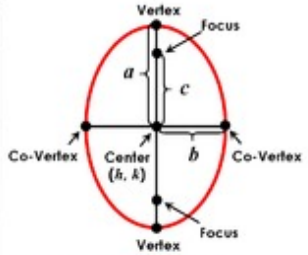
$$(y-k)^2 = 4p(x-h)$$

Opens RIGHT if $p > 0$
Opens LEFT if $p < 0$

ELLIPSE



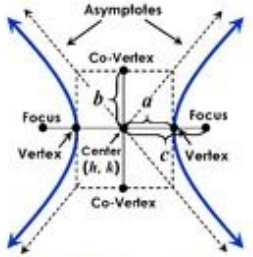
$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$



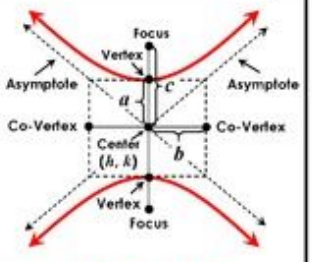
$$\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$$

FORMULA FOR C: $c^2 = a^2 - b^2$

HYPERBOLA



$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$



$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

FORMULA FOR C: $c^2 = a^2 + b^2$

Systems:

Graph (find points of intersection), Substitution, or Combination/Elimination

PreCalculus - Matrices

name: row x column add/sub: like dimensions

multiplication: $AB = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \cdot \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} aw+by & ax+bz \\ cw+dy & cx+dz \end{bmatrix}$

(r x c: r x c)

same

2x2 determinant: $\det A = |A| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

3x3 determinant: $\det A = |A| = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = (aei + bfg + cdh) - (gec + hfa + idb)$

2x2 inverse: $A^{-1} = \begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{|A|} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$I_n = \begin{pmatrix} 1 & 0 & 0 & \cdots & 0 \\ 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & 1 \end{pmatrix}$

solving systems: $AX = B$

$X = A^{-1}B$

PreCalculus - Angles & SOHCAHTOA

sin	+			sin	+
cos	-			cos	+
tan	-	**S**	**A**	tan	+
sin	-	**T**	**C**	sin	-
cos	-			cos	+
tan	+			tan	-

radians to degrees: $rad \cdot \frac{180°}{\pi}$

degrees to radians: $\deg \cdot \frac{\pi}{180°}$

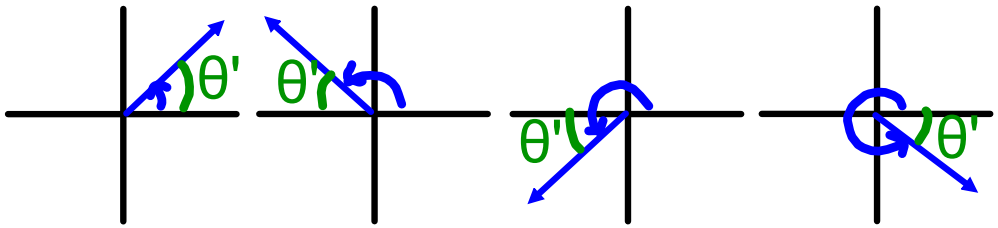
coterminal angles:

degrees ⇒ θ ± 360°

radians ⇒ x ± 2π

reference angles:

positive distance from x-axis



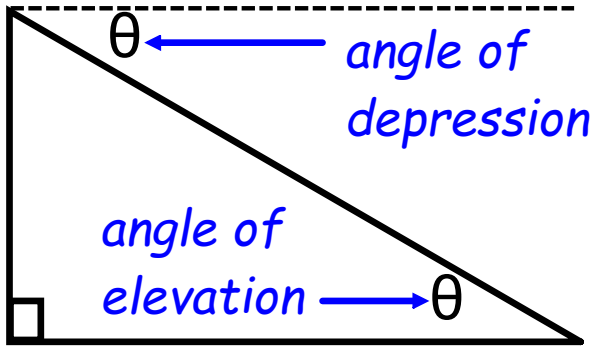
sine(sin)→cosecant(csc)
cosine(cos)→secant(sec)
tangent(tan)→cotangent(cot)

$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$

$\csc\theta = \frac{hyp}{opp}$ $\sec\theta = \frac{hyp}{adj}$ $\cot\theta = \frac{adj}{opp}$

PreCalculus - Triangle Trig

Right Triangle Apps:



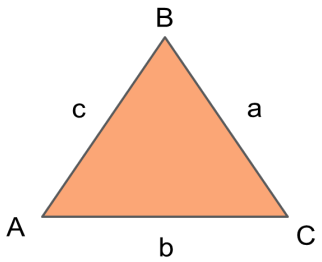
Area of a Triangle:

$$Area = \frac{1}{2}bcSinA$$

$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$

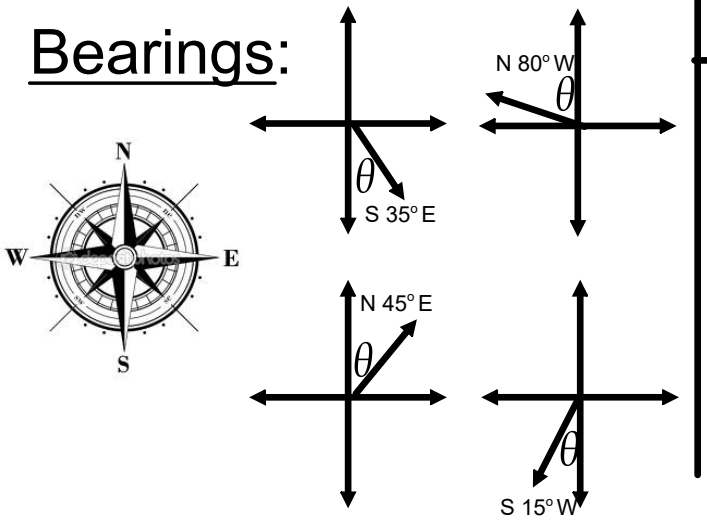
$$s = \frac{a+b+c}{2}$$

Law of Cosines (SAS or SSS):



- $a^2 = b^2 + c^2 - 2bcCosA$
- $b^2 = a^2 + c^2 - 2acCosB$
- $c^2 = a^2 + b^2 - 2abCosC$

Bearings:



Law of Sines (ASA, AAS or SSA!!):

$$\frac{a}{SinA} = \frac{b}{SinB} = \frac{c}{SinC}$$

Don't forget about the ambiguous case!

PreCalculus - Graphs of Trig Functions

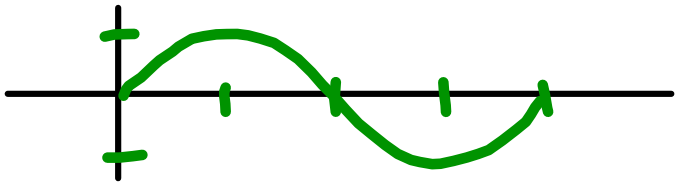
Transformations: $y = \pm a \cdot \sin(bx - c) + d$

- neg: reflects the x-axis
  amplitude: $|a|$
  vertical shrink/stretch
- period: $\frac{2\pi}{b}$ or $\frac{360^\circ}{b}$
- horizontal/phase shift
  $bx - c = 0$
  $b\theta - c = 0^\circ$
- vertical shift

$y = \pm a \cdot \cos(bx - c) + d$

Domain:
[phase shift, $bx - c = 2\pi$ / $b\theta - c = 360^\circ$]

Sine: [0, 2π]



Cosine [0, 2π]