

PreCalculus

The Nitty-Gritty for the Midterm ...

PreCalculus - Conic Sections

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

CIRCLE

Radius, r
Center (h, k)

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

PARABOLA

Focus
Vertex (h, k)
Directrix
Axis of Symmetry

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

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

Co-Vertex
Vertex
Center (h, k)
Focus
Co-Vertex

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

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

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

HYPERBOLA

Asymptotes
Co-Vertex
Vertex
Center (h, k)
Focus
Co-Vertex

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

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

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

Systems:

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

Midterm Review Info

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

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

solving systems: $AX = B$

$$X = A^{-1}B$$

PreCalculus - Angles & SOHCAHTOA

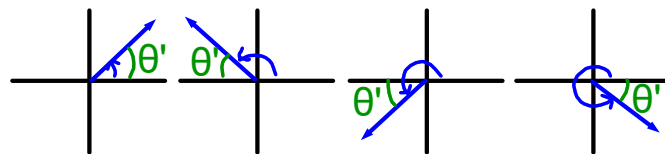
sin +	S A	sin +
cos -		cos +
tan -		tan +

sin -	T C	sin -
cos -		cos +
tan +		tan -

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

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

reference angles:
positive distance from x-axis



coterminal angles:

degrees $\Rightarrow \theta \pm 360^\circ$

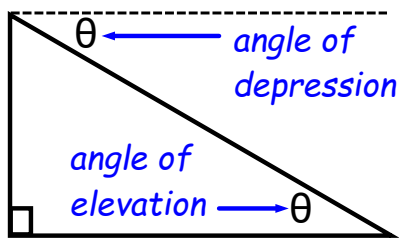
radians $\Rightarrow x \pm 2\pi$

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

$$\begin{aligned} \sin \theta &= \frac{opp}{hyp} & \cos \theta &= \frac{adj}{hyp} & \tan \theta &= \frac{opp}{adj} \\ \csc \theta &= \frac{hyp}{opp} & \sec \theta &= \frac{hyp}{adj} & \cot \theta &= \frac{adj}{opp} \end{aligned}$$

PreCalculus - Triangle Trig

Right Triangle Apps:



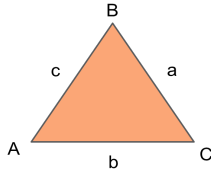
Area of a Triangle:

$$Area = \frac{1}{2} bc \sin A$$

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

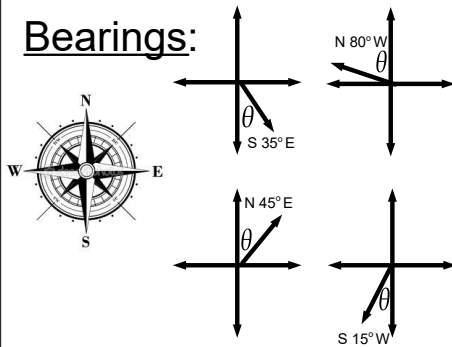
$$s = \frac{a+b+c}{2}$$

Law of Cosines (SAS or SSS):



- $a^2 = b^2 + c^2 - 2bc \cos A$
- $b^2 = a^2 + c^2 - 2ac \cos B$
- $c^2 = a^2 + b^2 - 2ab \cos C$

Bearings:



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

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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 $\frac{360^\circ}{b}$

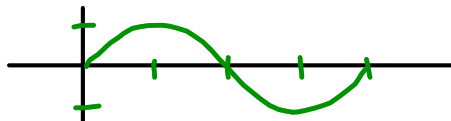
horizontal/phase shift
 $bx - c = 0$
 $b\theta - c = 0^\circ$

vertical shift

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

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

Sine: $[0, 2\pi]$



Cosine $[0, 2\pi]$

