Section 2.3 Trigonometery

(references 2.1, 2.2)

For any right triangle with hypotenuse *h*, an acute angle α, side length *o* opposite from α, and side length *a* adjacent to α, the following terms are defined:

sine $\alpha = \sin \alpha = o/h$

cosine $\alpha = \cos \alpha = a/h$

tangent $\alpha = \tan \alpha = o/a = \sin \alpha / \cos \alpha$

cotangent $\alpha = \cot \alpha = \text{ctn}\, \alpha = a/o = 1/\tan \alpha = \cos \alpha / \sin \alpha$

secant $\alpha = \sec \alpha = h/a = 1/\cos \alpha$

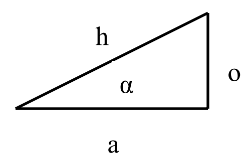
cosecant $\alpha = \csc \alpha = h/o = 1/\sin \alpha$

exsecant $\alpha = \text{exsec}\, \alpha = \sec \alpha - 1$

versine $\alpha = \text{vers}\, \alpha = 1 - \cos \alpha$

coversine $\alpha = \text{covers}\, \alpha = 1 - \sin \alpha$

haversine $\alpha = \text{hav}\, \alpha = (\text{vers}\, \alpha)/2$



also defined are the following…

hyperbolic sine of $x = \sinh x = (e^x - e^{-x})/2$

hyperbolic cosine of $x = \cosh x = (e^x + e^{-x})/2$

hyperbolic tangent of $x = \tanh x = \sinh x / \cosh x$

$\text{csch}\, x = 1/\sinh x$

$\text{sech}\, x = 1/\cosh x$

$\coth x = 1/\tanh x$

IDENTITIES

Pythagorean Identities:

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

$1 + \tan^2 \alpha = \sec^2 \alpha$

$1 + \cot^2 \alpha = \csc^2 \alpha$

Half Angle Identities:

$\sin [\alpha/2] = +/- \ [(1 - \cos \alpha)/2]^{1/2}$

(negative if $[\alpha/2]$ is in quadrant III or IV)

$\cos [\alpha/2] = +/- \ [(1 + \cos \alpha)/2]^{1/2}$

(negative if $[\alpha/2]$ is in quadrant II or III)

$\tan [\alpha/2] = +/- \ [(1 - \cos \alpha)/(1 + \cos \alpha)]^{1/2}$

(negative if $[\alpha/2]$ is in quadrant II or IV)