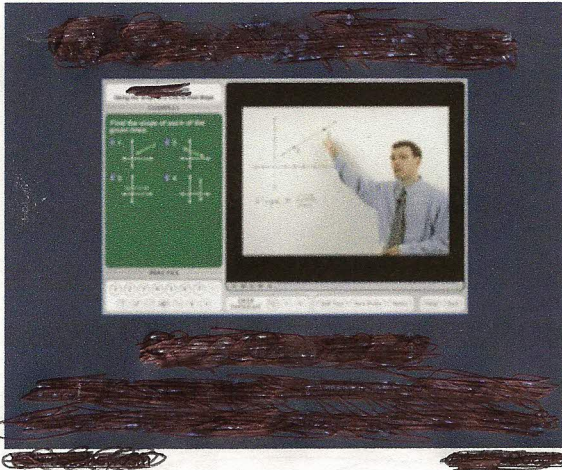


Trigonometric Identities and Formulas



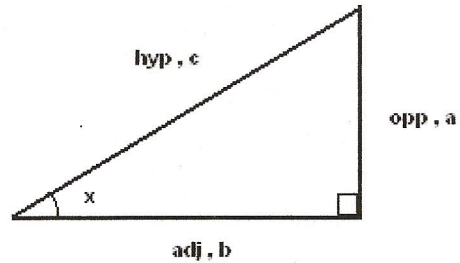
Below are some of the most important definitions, identities and formulas in trigonometry.

1. Trigonometric Functions of Acute Angles

$$\sin X = \text{opp} / \text{hyp} = a / c, \quad \csc X = \text{hyp} / \text{opp} = c / a$$

$$\tan X = \text{opp} / \text{adj} = a / b, \quad \cot X = \text{adj} / \text{opp} = b / a$$

$$\cos X = \text{adj} / \text{hyp} = b / c, \quad \sec X = \text{hyp} / \text{adj} = c / b,$$



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[Excel Formulas](#)
[Triangle Formulas](#)
[Sin Cos Tan Formulas](#)

Simplifying Tangents:

$$2 \tan \left(x + \frac{\pi}{4} \right)$$

$$\textcircled{1} -\frac{\pi}{2} < x + \frac{\pi}{4} < \frac{\pi}{2}$$

$$\textcircled{A} x + \frac{\pi}{4} < \frac{\pi}{2}$$

$$x < \frac{\pi}{4}$$

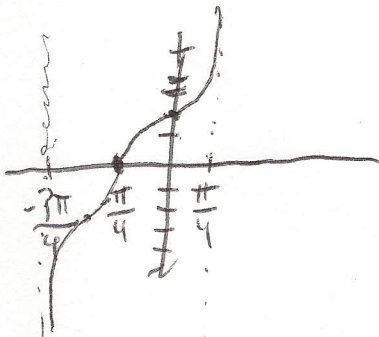
$$\textcircled{B} x + \frac{\pi}{4} > -\frac{\pi}{2}$$

$$x > -\frac{3\pi}{4}$$

$$\textcircled{1} x = \text{intercept} \frac{A+B}{2}$$

$$\textcircled{2} Y\text{-midpoint (use # in final eqn)} \Rightarrow 2$$

$$\textcircled{4} \left. \begin{array}{l} \text{positive} \\ \text{or negative} \end{array} \right\}$$



2. Trigonometric Functions of Arbitrary Angles

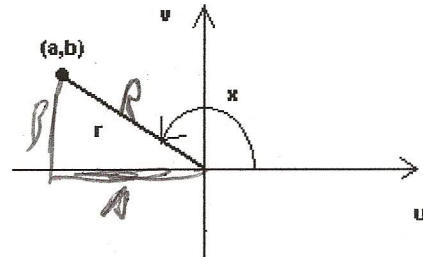
$$\sin X = b / r, \quad \csc X = r / b$$

$$\tan X = b / a, \quad \cot X = a / b$$

$$\cos X = a / r, \quad \sec X = r / a$$



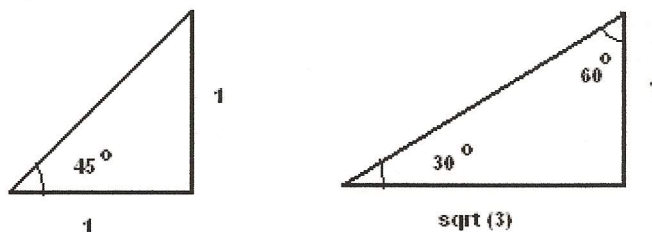
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3. Special Triangles

A tangent use $\frac{\pi}{4}$ & $-\frac{\pi}{4}$ (cotangents use $\frac{\pi}{4}$ & $-\frac{\pi}{4}$)

Special triangles may be used to find trigonometric functions of special angles: 30, 45 and 60 degrees.



4. Sine and Cosine Laws in Triangles

In any triangle we have:

1 - The sine law

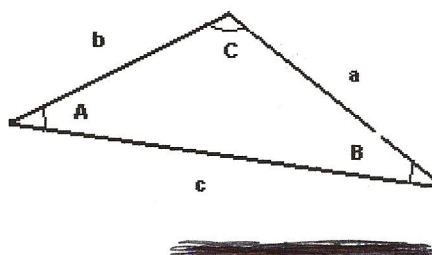
$$\sin A / a = \sin B / b = \sin C / c$$

2 - The cosine laws

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$



5. Relations Between Trigonometric Functions

$$\csc X = 1 / \sin X$$

$$\sin X = 1 / \csc X$$

$$\sec X = 1 / \cos X$$

$$\cos X = 1 / \sec X$$

$$\tan X = 1 / \cot X$$

$$\cot X = 1 / \tan X$$



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