

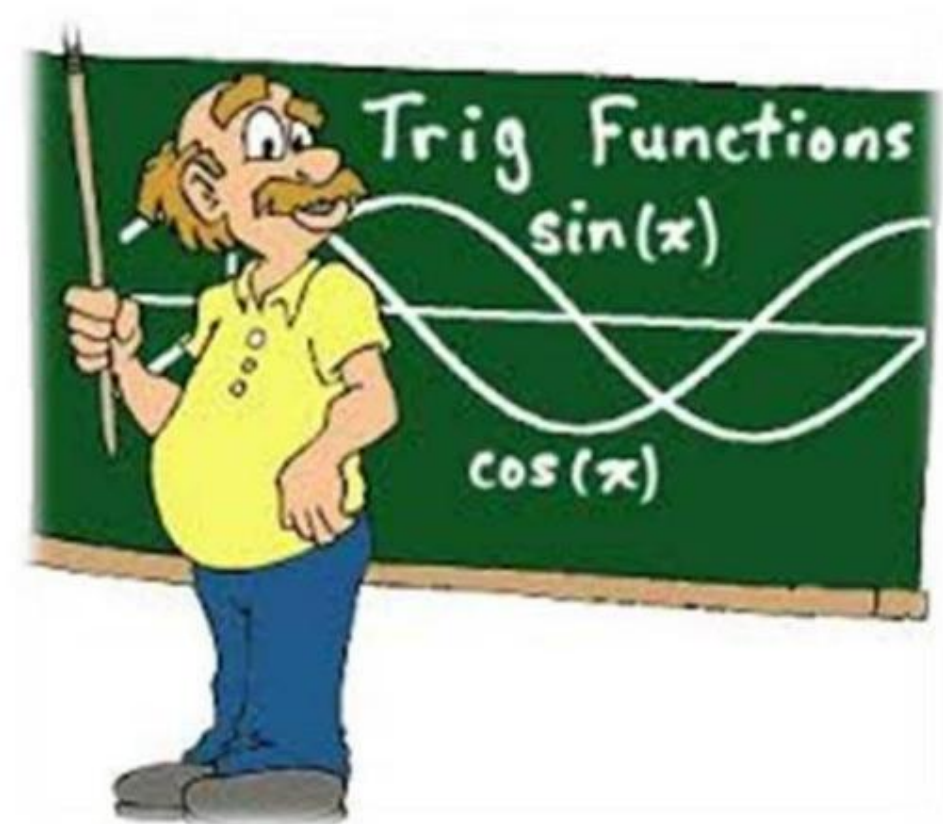
Trigonometry - II

By SLIIT Mathematics Unit
Faculty of Humanities and
Sciences

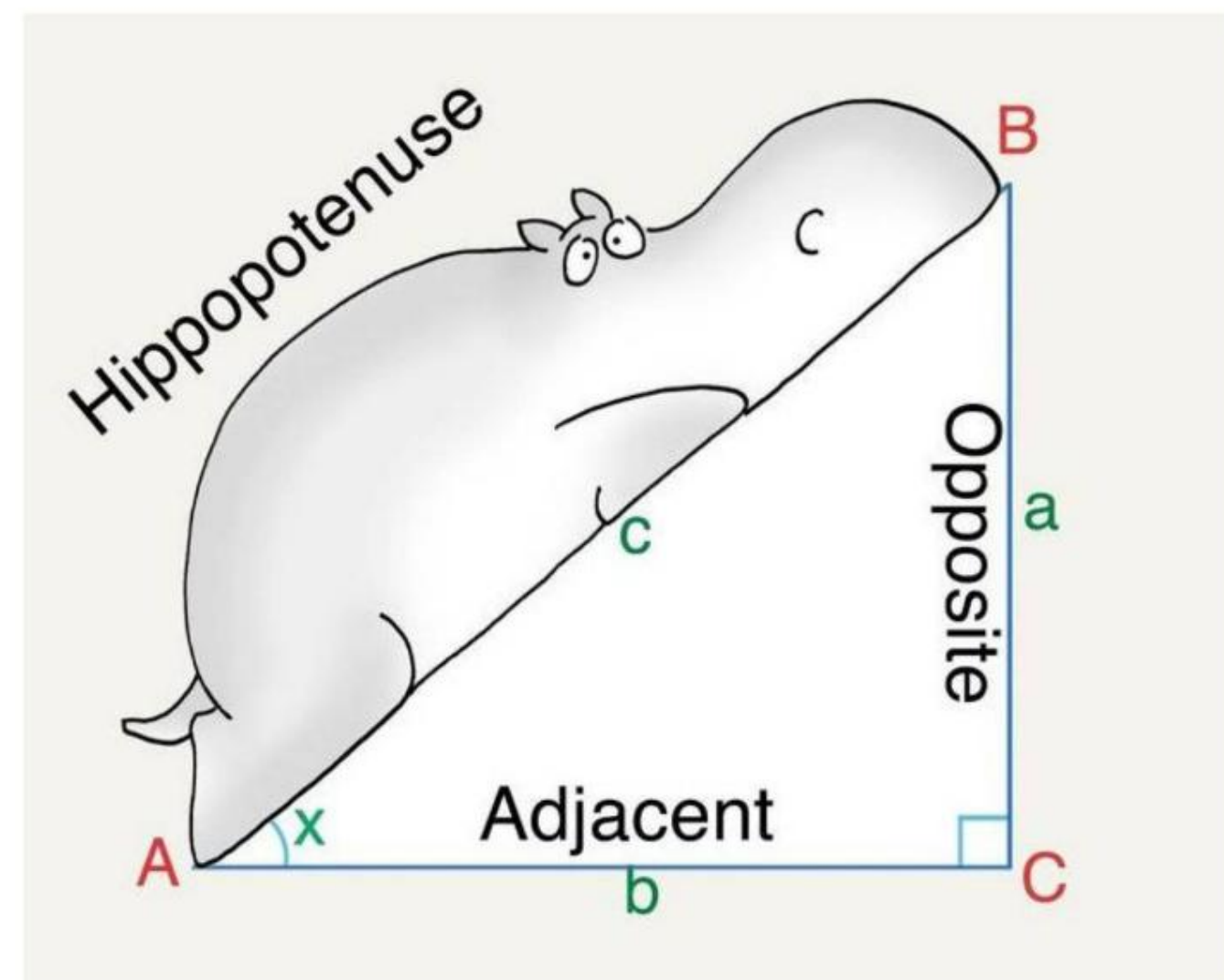
Content

- Right Triangle Trigonometry
- Fundamental Trigonometric Identities

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1. Right Triangle Trigonometry



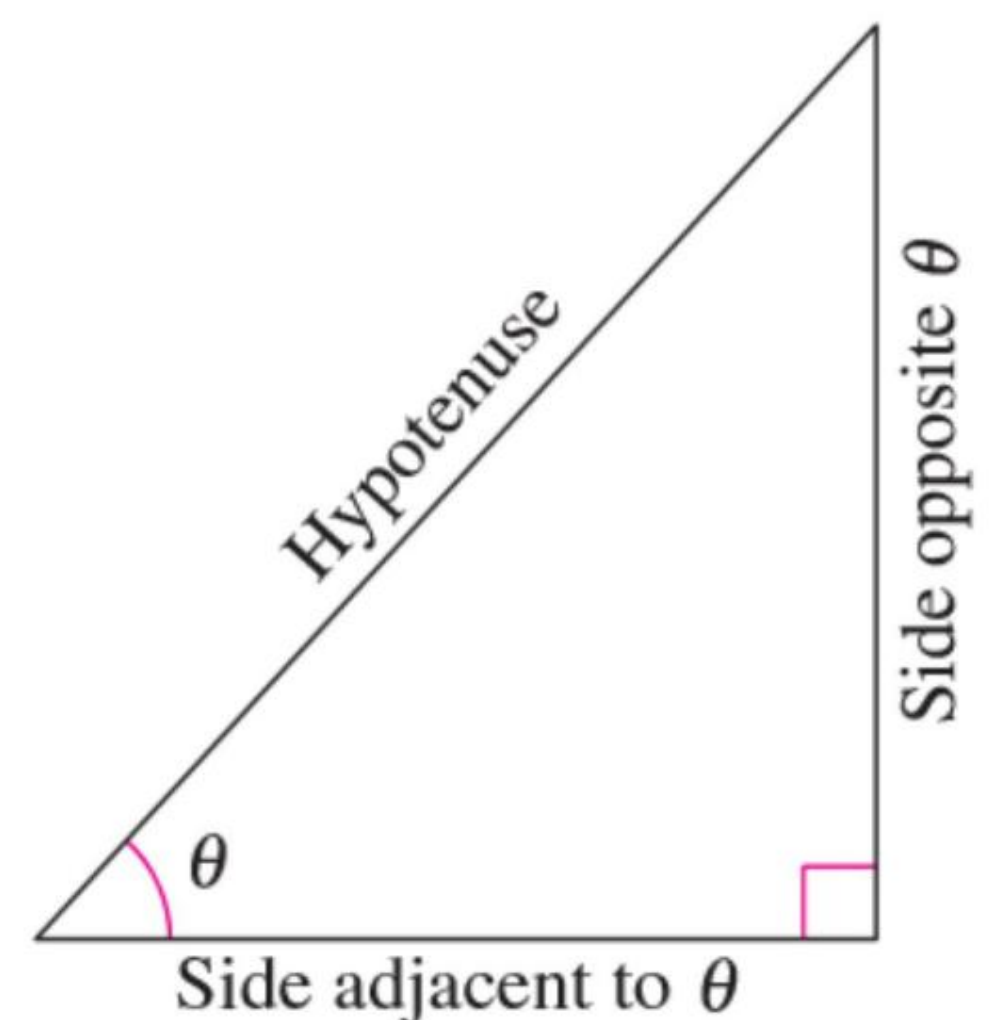
Right Triangle Trigonometry

- Trigonometric functions are introduced from a right triangle perspective

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Right Triangle Trigonometry

- Relative to the angle θ the three sides of the triangle are
 - the hypotenuse,
 - the opposite side (the side opposite the angle)
 - the adjacent side (the side adjacent to the angle)



Right Triangle Definitions of Trigonometric Functions

- The six trigonometric functions of the angle are defined as follows.

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}}$$

$$\sec \theta = \frac{\text{hyp}}{\text{adj}}$$

$$\cot \theta = \frac{\text{adj}}{\text{opp}}$$

The abbreviations

opp, adj, and hyp

represent the lengths of the three sides of a right triangle.

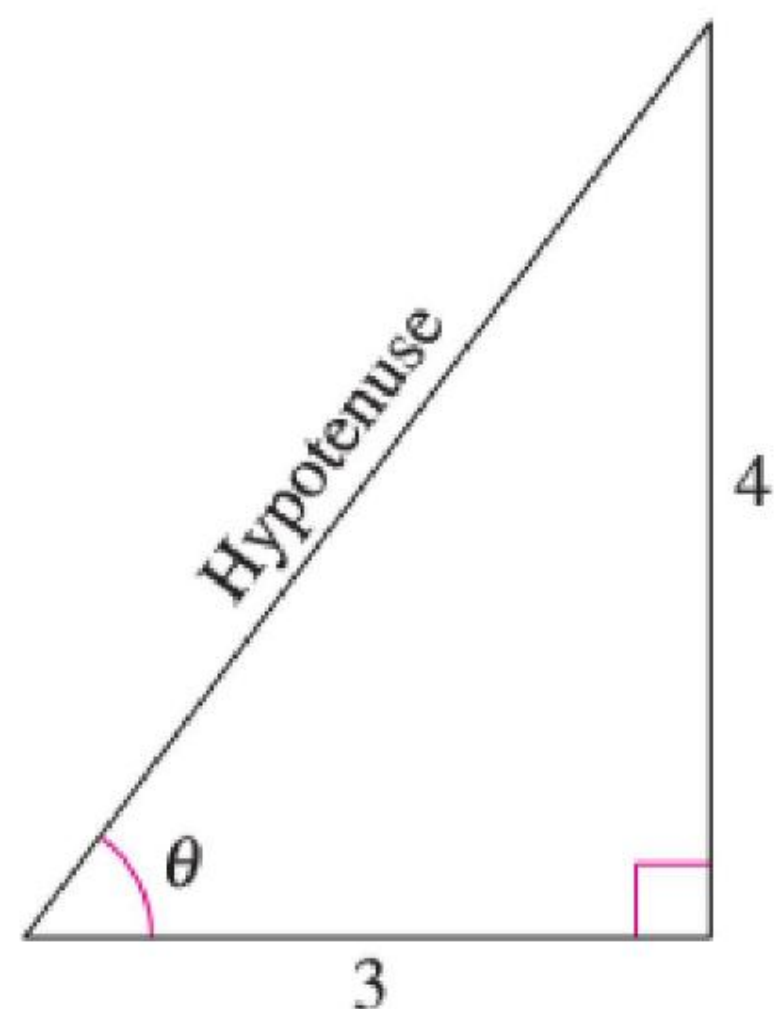
opp = the length of the side *opposite* θ

adj = the length of the side *adjacent to* θ

hyp = the length of the *hypotenuse*

Evaluating Trigonometric Functions

- Use the triangle to find the values of the six trigonometric functions of θ .



2.

Fundamental Trigonometric Identities

Trigonometric Identities



Reciprocal Identities

$$\sin \theta = \frac{1}{\csc \theta}$$

$$\cos \theta = \frac{1}{\sec \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

Quotient Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

Pythagorean Identities

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

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

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

Exercises

- Use trigonometric identities to transform the left side of the equation into the right side.
 - a. $\sin \theta \csc \theta = 1$
 - b. $(\csc \theta + \cot \theta)(\csc \theta - \cot \theta) = 1$

Exercises

- Factorize the trigonometric identities

a. $\sec^2 \theta - 1$ b. $4 \tan^2 \theta + \tan \theta - 3$

Exercises

Perform the addition $\frac{\sin \theta}{1 + \cos \theta} + \frac{\cos \theta}{\sin \theta}$ and simplify.

Exercises

- Verify the following trigonometric identities.

$$\frac{\cos \theta \cot \theta}{1 - \sin \theta} - 1 = \csc \theta$$

$$\frac{1}{\cos x + 1} + \frac{1}{\cos x - 1} = -2 \csc x \cot x$$

$$\cos x - \frac{\cos x}{1 - \tan x} = \frac{\sin x \cos x}{\sin x - \cos x}$$

Thanks!

Any questions?

