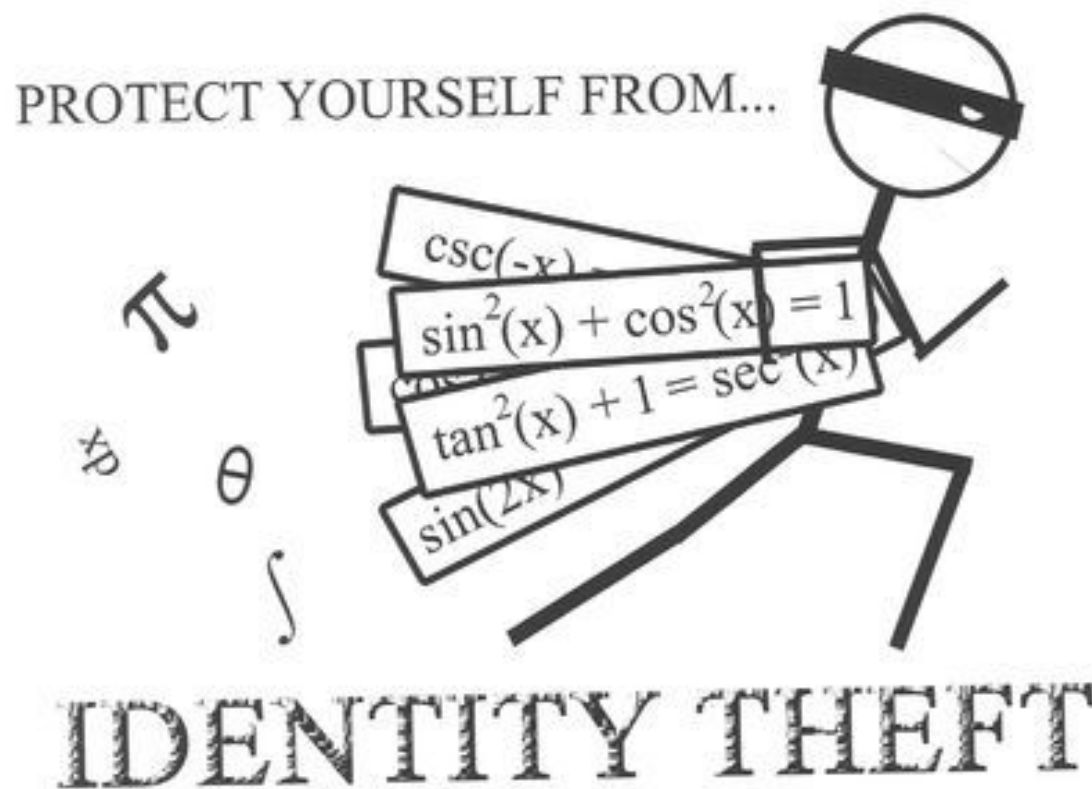


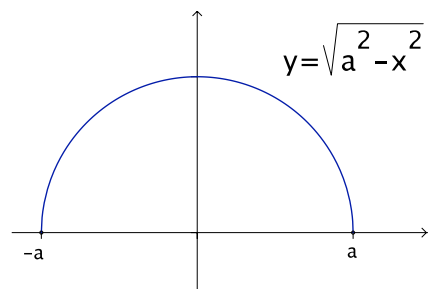
# Trigonometric Substitutions



created by: David Ritzenthaler

3.14.2013

**1. Problem.** Assuming that  $|x| \leq a$ , evaluate



$$\int \sqrt{a^2 - x^2} dx.$$

## 2. Integration by Substitution (using Trigonometric Function).

If the integral involves

then substitute

and use the identity

$$a^2 - u^2$$

$$u = a \sin \theta$$

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

$$a^2 + u^2$$

$$u = a \tan \theta$$

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

$$u^2 - a^2$$

$$u = a \sec \theta$$

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

3. **Example.** Integrate  $\int \sqrt{1 - x^2} \, dx$ , assuming  $|x| < 1$

4.  $\int_5^{\sqrt{50}} \frac{\sqrt{x^2 - 25}}{x} dx =$

Notes.

