

Recall: Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1 \quad \Rightarrow \sin^2 x = 1 - \cos^2 x$$

$$\quad \quad \quad \quad \quad \quad \quad \Rightarrow \cos^2 x = 1 - \sin^2 x$$

$$\sec^2 x = 1 + \tan^2 x \quad \Rightarrow \tan^2 x = \sec^2 x - 1$$

Recall: Double Angle (Reduction) Formulas

$$\sin 2x = 2 \sin x \cos x$$

$$\cos 2x = 2 \cos^2 x - 1 \quad \Rightarrow \cos^2 x = \frac{1}{2}(\cos 2x + 1)$$

$$\cos 2x = 1 - 2 \sin^2 x \quad \Rightarrow \sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

Guidelines for Trigonometric Substitutions –

look at format under the radical:

Given:**Use:**

$$\sqrt{a^2 - x^2}$$

$$x = a \sin \theta$$

$$\sqrt{a^2 + x^2}$$

$$x = a \tan \theta$$

$$\sqrt{x^2 - a^2}$$

$$x = a \sec \theta$$

Sometimes, the above formats appear without the radical...

ex. $\int \frac{x^2 dx}{1+x^2}$

ex. $\int \frac{dx}{x^2 \sqrt{25+x^2}}$

$$\text{ex. } \int \frac{x^3 dx}{(1+x^2)^{5/2}}$$