

**An important Limit**

$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1 .$$

**The derivatives of  $y = \sin u$ ,  $y = \cos u$  :**

$$\frac{d}{dx}(\sin x) = \cos x , \quad \frac{d}{dx}(\sin u) = \cos u \frac{du}{dx} .$$

$$\frac{d}{dx}(\cos x) = -\sin x , \quad \frac{d}{dx}(\cos u) = -\sin u \frac{du}{dx} .$$

**Example 1.** Differentiate  $y = \sin \sqrt{x^2 + 1}$ .

**Example 2.** Find the derivative of  $y = x^2 \cos x^3$ .

**Example 3.** Find the derivative of  $y = \frac{\sin^2 x}{\sqrt{x}}$ .