Thus, in a right triangle ABC (see Figure 9–7), we have the following relations:

1. $\sin A = \frac{a}{c} = \cos B$

2. $\cos A = \frac{b}{c} \sin B$

3. $\tan A = \frac{a}{b} = \cot B$

4. $\cot A = \frac{b}{a} = \tan B$

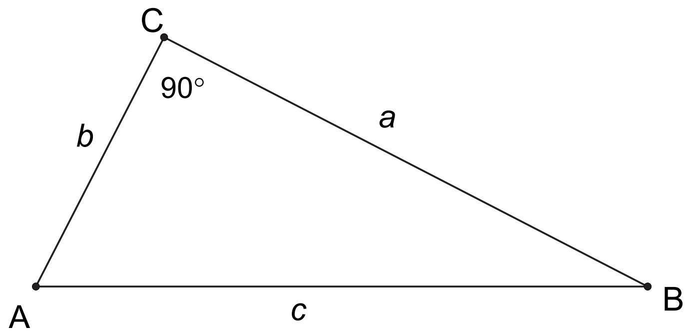

FIGURE 9–7

9.4 RELATIONS AMONG TRIGONOMETRIC FUNCTIONS

There are six basic relations among trigonometric functions. They are referred to as basic **identities**:

1. $\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$

2. $\cot\alpha = \frac{\cos\alpha}{\sin\alpha}$

3. $\tan\alpha \cdot \cot\alpha = 1$

4. $\sin^2\alpha + \cos^2\alpha = 1$

5. $\tan 2\alpha + 1 = \alpha = \frac{1}{\cos^2\alpha}$, $\cos\alpha \neq 0$

6. $1 + \cot^2\alpha = \frac{1}{\sin^2\alpha}$, $\sin\alpha \neq 0$

Often $\frac{1}{\sin\alpha}$ is denoted by $\csc\alpha$ and $\frac{1}{\cos\alpha}$ by $\sec\alpha$.

Thus identities 5 and 6 can be written as:

7. $\tan^2\alpha + 1 = \sec^2\alpha$

8. $1 + \cot^2\alpha = \csc^2\alpha$.

To prove these formulas for an acute angle α, let $\triangle ABC$ be a right triangle in C with the acute angle $\measuredangle BAC = \alpha$. Let $AC = b$, $CB = a$, and $AB = c$, as shown in Figure 9–8.