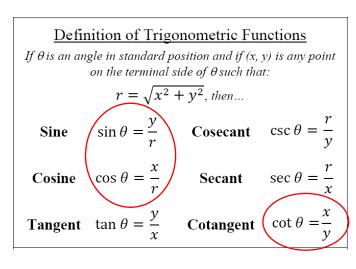
How to use the definitions of the trigonometric functions to prove an identity:

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

 $\cot \theta = \frac{\frac{x}{r}}{\frac{y}{r}} \to \frac{x}{r} \div \frac{y}{r}$



Given

Substitute in the definitions of $\sin\theta \& \cos\theta$. A fraction indicates division, so I rewrote the expression to show this more clearly.

When you divide fractions, you multiply the first fraction by the reciprocal of the second fraction.

After multiplying and simplifying, I have the definition of $\cot \theta$.

Given.

Substitute in the definitions of $\sin\theta \& \cos\theta$.

Simplify.

Add the fractions.

We know that $r^2 = x^2 + y^2$ so we make this substitution.

$$\cot \theta = \frac{x}{r} \times \frac{r}{y} = \frac{xr}{ry}$$
$$\cot \theta = \frac{x}{y}$$
$$1 = \sin^2 \alpha + \cos^2 \alpha$$
$$1 = \left(\frac{y}{r}\right)^2 + \left(\frac{x}{r}\right)^2$$
$$1 = \frac{y^2}{r^2} + \frac{x^2}{r^2}$$
$$1 = \frac{y^2 + x^2}{r^2}$$
$$1 = \frac{r^2}{r^2}$$
$$1 = 1$$