List of trig integrals

For each pair, we list $F(x)$ first and then $\int f(x)\ dx$—since it feels more natural to reconstruct each one by taking the derivative of $F(x)$. Don't forget the constant:

$$F(x) + C = \int f(x)\ dx$$

$$\sin x \Longleftrightarrow \cos x$$

$$\cos x \Longleftrightarrow -\sin x$$

$$\tan x \Longleftrightarrow \sec^2 x$$

$$\sec x \Longleftrightarrow \sec x \tan x$$

The derivatives of cosecant and cotangent can be reconstructed by noticing the pattern of substituting the corresponding "co" functions and changing sign:

$$\csc x \Longleftrightarrow -\csc x \cot x$$

$$\cot x \Longleftrightarrow -\csc^2 x$$

We are missing tangent and secant from the list of derivatives . The tangent is obtained by u-substitution (sine is *minus* the derivative of cosine). The secant is obtained by a trick, multiplying on top and bottom by $(\sec x + \tan x)$ giving $\int du/u$:

$$-\ln|\cos x| \Longleftrightarrow \tan x$$

$$\ln|\sec x + \tan x| \Longleftrightarrow \sec x$$

Again, the integrals of cosecant and cotangent can be constructed by substituting "co" functions and flipping signs (it is easy to check it for cotangent).

$$\ln|\sin x| \Longleftrightarrow \cot x$$

$$-\ln|\csc x + \cot x| \Longleftrightarrow \csc x$$

I suggest memorizing all 10 of these, and writing them out quickly at the beginning of an exam. It provides a resource so you don't have to remember them (especially the co versions), under pressure.