Integrals of Trig Functions (7.2):

   A: $\int \sin^m x \cos^n x \; dx$

   (1) m odd: Strip 1 sine out and convert the rest to cosines using $\sin^2 x = 1 - \cos^2 x$. Then make the substitution $u = \cos x$.

   (2) n odd: Strip 1 cosine out and convert the rest to sines using $\cos^2 x = 1 - \sin^2 x$. Then make the substitution $u = \sin x$.

   (3) m and n both odd: Use either (1) or (2).

   (4) m and n both even: Use double/half angle formulas to reduce to a form that can be integrated.

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

   B: $\int \tan^m x \sec^n x \; dx$ (and similarly $\int \cot^m x \csc^n x \; dx$)

   (1) m odd: Strip 1 tangent and 1 secant out and convert the rest to secants using $\tan^2 x = \sec^2 x - 1$. Then make the substitution $u = \sec x$.

   (2) n even: Strip 2 secants out and convert the rest to tangents using $\sec^2 x = \tan^2 x + 1$. Then make the substitution $u = \tan x$.

   (3) m odd and n even: Use either (1) or (2).

   (4) m even and n odd: Replace $\tan^2 x$ with $\sec^2 x - 1$ and go from there (not an important case).

Trig substitutions (7.3):

If the integral contains the following expression, make the substitution and use the trig identity given below.
   - $\sqrt{a^2 - b^2 x^2} \Rightarrow x = \frac{a}{b}\sin\theta$, $\cos^2\theta = 1 - \sin^2\theta$.
   - $\sqrt{a^2 + b^2 x^2} \Rightarrow x = \frac{a}{b}\tan\theta$, $\sec^2\theta = 1 + \tan^2\theta$.
   - $\sqrt{b^2 x^2 - a^2} \Rightarrow x = \frac{a}{b}\sec\theta$, $\tan^2\theta = \sec^2\theta - 1$.