$$\int x^n\,dx = \frac{x^{n+1}}{n+1} \quad (n \neq -1)$$

$$\int \frac{1}{x}\,dx = \ln|x|$$

$$\int e^x\,dx = e^x$$

$$\int a^x\,dx = \frac{a^x}{\ln a}$$

$$\int \sin x\,dx = -\cos x$$

$$\int \cos x\,dx = \sin x$$

$$\int \sec^2 x\,dx = \tan x$$

$$\int \csc^2 x\,dx = -\cot x$$

$$\int \sec x \tan x\,dx = \sec x$$

$$\int \csc x \cot x\,dx = -\csc x$$

$$\int \sec x\,dx = \ln|\sec x + \tan x|$$

$$\int \csc x\,dx = \ln|\csc x - \cot x|$$

$$\int \tan x\,dx = \ln|\sec x|$$

$$\int \cot x\,dx = \ln|\sin x|$$

$$\int \sinh x\,dx = \cosh x$$

$$\int \cosh x\,dx = \sinh x$$

$$\int \frac{1}{x^2+a^2}dx = \frac{1}{a}\tan^{-1}\frac{x}{a}$$

$$\int \frac{1}{\sqrt{a^2-x^2}}dx = \sin^{-1}\frac{x}{a},\ a>0$$

$$\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\ln\left|\frac{x-a}{x+a}\right|$$

$$\int \frac{dx}{\sqrt{x^2\pm a^2}} = \ln\left|x+\sqrt{x^2\pm a^2}\right|$$

Strategy for Integration

1. Simplify the Integrand if Possible

- Try algebraic manipulations or trigonometric identities.

2. Look for an Obvious Substitution

- Try to find a $u = g(x)$ such that $du = g'(x)dx$ also occurs.

3. Classify the Integrand According to Its Form

(a) *Trigonometric functions*, use substitutions or half-angle formulas

(b) *Rational functions*, use division and partial fractions

(c) *Integration by parts*, look for products according to the LIATE rule

(d) *Radicals*

(i) $\sqrt{\pm x^2 \pm a^2}$ - use trigonometric substitution

(ii) $\sqrt[n]{ax+b}$ - use rationalization substitution $u = \sqrt[n]{ax+b}$

Strategy for Integration

4. Try Again

(a) *Try substitution*, including non-obvious ones

(b) *Try parts*, e.g. on single functions such as $\ln x$

(c) *Manipulate the integrand*, like in step **1.** but more substantial

(d) *Relate the problem to previous problems*, remember previously calculated integrals and previously used tricks

(e) *Use several methods*, such as several substitutions, or substitutions and integration by parts