Table of integrals to remember. The $+C$ is omitted everywhere.

$$\int x^\alpha\,dx = \frac{1}{\alpha+1}x^{\alpha+1} \quad \text{for all real numbers } \alpha \neq -1.$$

$$\int x^{-1}\,dx = \ln|x|.$$

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

$$\int a^x\,dx = \frac{1}{\ln a}a^x.$$

$$\int \ln(x)\,dx = x\ln x - x.$$

$$\int \sin(x)\,dx = -\cos(x);$$

$$\int \cos(x)\,dx = \sin(x).$$

$$\int \frac{1}{\sqrt{1-x^2}} = \sin^{-1}(x)$$

$$\int \frac{1}{1+x^2} = \tan^{-1}(x)$$

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

Note: if in the trigonometric integrals above, instead of $1-x^2$ or $1+x^2$ you have a^2-x^2 or a^2+x^2, then use the substitution $u = x/a$; if you have some other quadratic polynomial, then *complete the square*, and reduce it to a^2-x^2, a^2+x^2, or x^2-a^2.

Also, remember the following basic techniques:

- substitution.
- For expressions such as $x^n \ln x$ or $x^n e^x$, or $x^n \sin(x)$, $x^n \cos(x)$, use integration by parts.
- The startegy for integrating $\sin^n(x)\cos^m(x)\,dx$ is to make a substitution $u = \cos(x)$ or $u = \sin(x)$ (use the function whose power is odd); if both powers are even, use double-angle formulas to reduce to smaller powers of the functions of $2x$.

  The main double angle formula:

  $$\cos(2x) = \cos^2 x - \sin^2 x = 2\cos^2 x - 1.$$

  Then $\cos^2 x = \frac{\cos(2x)+1}{2}$.