

Formula Sheet

A short table of integrals. In the following, $a \neq 0$.

$$1. \int \frac{du}{\sqrt{a^2 + u^2}} = \sinh^{-1} \left(\frac{u}{a} \right) + C \quad \text{for } a > 0$$

$$2. \int \frac{du}{\sqrt{a^2 - u^2}} = \sin^{-1} \left(\frac{u}{a} \right) + C \quad \text{for } u^2 < a^2$$

$$3. \int \frac{du}{\sqrt{u^2 - a^2}} = \cosh^{-1} \left(\frac{u}{a} \right) + C \quad \text{for } u > a > 0$$

$$4. \int \frac{du}{a^2 + u^2} = \frac{1}{a} \tan^{-1} \left(\frac{u}{a} \right) + C$$

$$5. \int \frac{du}{a^2 - u^2} = \begin{cases} \frac{1}{a} \tanh^{-1} \left(\frac{u}{a} \right) + C & \text{if } u^2 < a^2 \\ \frac{1}{a} \coth^{-1} \left(\frac{u}{a} \right) + C & \text{if } u^2 > a^2 \end{cases}$$

$$6. \int \frac{du}{u\sqrt{a^2 + u^2}} = -\frac{1}{a} \operatorname{csch}^{-1} \left| \frac{u}{a} \right| + C \quad \text{for } u \neq 0$$

$$7. \int \frac{du}{u\sqrt{a^2 - u^2}} = -\frac{1}{a} \operatorname{sech}^{-1} \left(\frac{u}{a} \right) + C \quad \text{for } 0 < u < a$$

$$8. \int \frac{du}{u\sqrt{u^2 - a^2}} = \frac{1}{a} \operatorname{sec}^{-1} \left| \frac{u}{a} \right| + C \quad \text{for } u^2 > a^2$$

Some circular and hyperbolic trig identities.

$$1. \cos^2 x + \sin^2 x = 1$$

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

$$3. \sin^2 x = \frac{1 - \cos(2x)}{2}$$

$$4. \cosh^2 x - \sinh^2 x = 1$$

$$5. \cosh^2 x = \frac{\cosh(2x) + 1}{2}$$

$$6. \sinh^2 x = \frac{\cosh(2x) - 1}{2}$$

In formulas (3)–(6), x remains fixed as $n \rightarrow \infty$.

$$1. \lim_{n \rightarrow \infty} \frac{\ln n}{n} = 0$$

$$2. \lim_{n \rightarrow \infty} \sqrt[n]{n} = 1$$

$$3. \lim_{n \rightarrow \infty} x^{1/n} = 1 \quad (x > 0)$$

$$4. \lim_{n \rightarrow \infty} x^n = 0 \quad (|x| < 1)$$

$$5. \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n} \right)^n = e^x \quad (\text{Any } x)$$

$$6. \lim_{n \rightarrow \infty} \frac{x^n}{n!} = 0 \quad (\text{Any } x)$$