MAST10006 Calculus 2 Formulae Sheet

$$\int \sin x \, dx = -\cos x + C \qquad \int \cos x \, dx = \sin x + C$$

$$\int \sec x \, dx = \log|\sec x + \tan x| + C \qquad \int \operatorname{cosec} x \, dx = \log|\operatorname{cosec} x - \cot x| + C$$

$$\int \sec^2 x \, dx = \tan x + C \qquad \int \operatorname{cosec}^2 x \, dx = -\cot x + C$$

$$\int \sinh x \, dx = \cosh x + C \qquad \int \cosh x \, dx = \sinh x + C$$

$$\int \operatorname{sech}^2 x \, dx = \tanh x + C \qquad \int \operatorname{cosech}^2 x \, dx = -\coth x + C$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \arcsin\left(\frac{x}{a}\right) + C \qquad \int \frac{1}{\sqrt{x^2 + a^2}} \, dx = \operatorname{arcsinh}\left(\frac{x}{a}\right) + C$$

$$\int \frac{-1}{\sqrt{a^2 - x^2}} \, dx = \arccos\left(\frac{x}{a}\right) + C \qquad \int \frac{1}{\sqrt{x^2 - a^2}} \, dx = \operatorname{arccosh}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C \qquad \int \frac{1}{a^2 - x^2} \, dx = \frac{1}{a} \operatorname{arctanh}\left(\frac{x}{a}\right) + C$$

where $a > 0$ is constant and C is an arbitrary constant of integration.

$$\cos^2 x + \sin^2 x = 1 \qquad \cosh^2 x - \sinh^2 x = 1$$
$$1 + \tan^2 x = \sec^2 x \qquad 1 - \tanh^2 x = \operatorname{sech}^2 x$$
$$\cot^2 x + 1 = \operatorname{cosec}^2 x \qquad \coth^2 x - 1 = \operatorname{cosech}^2 x$$

$$\cos(2x) = \cos^2 x - \sin^2 x \qquad \cosh(2x) = \cosh^2 x + \sinh^2 x$$
$$\cos(2x) = 2\cos^2 x - 1 \qquad \cosh(2x) = 2\cosh^2 x - 1$$
$$\cos(2x) = 1 - 2\sin^2 x \qquad \cosh(2x) = 1 + 2\sinh^2 x$$
$$\sin(2x) = 2\sin x \cos x \qquad \sinh(2x) = 2\sinh x \cosh x$$

$$\cos(x + y) = \cos x \cos y - \sin x \sin y \qquad \cosh(x + y) = \cosh x \cosh y + \sinh x \sinh y$$
$$\sin(x + y) = \sin x \cos y + \cos x \sin y \qquad \sinh(x + y) = \sinh x \cosh y + \cosh x \sinh y$$

$$\cosh x = \frac{1}{2}\left(e^x + e^{-x}\right) \qquad \sinh x = \frac{1}{2}\left(e^x - e^{-x}\right)$$

$$\cos x = \frac{1}{2}\left(e^{ix} + e^{-ix}\right) \qquad \sin x = \frac{1}{2i}\left(e^{ix} - e^{-ix}\right)$$

$$e^{ix} = \cos x + i \sin x \qquad \operatorname{arctanh} x = \frac{1}{2}\log\left(\frac{1+x}{1-x}\right)$$

$$\operatorname{arcsinh} x = \log(x + \sqrt{x^2 + 1}) \qquad \operatorname{arccosh} x = \log(x + \sqrt{x^2 - 1})$$

$$\lim_{n\to\infty} \frac{1}{n^p} = 0 \quad (p > 0) \qquad \lim_{n\to\infty} r^n = 0 \quad (|r| < 1)$$

$$\lim_{n\to\infty} a^{\frac{1}{n}} = 1 \quad (a > 0) \qquad \lim_{n\to\infty} n^{\frac{1}{n}} = 1$$

$$\lim_{n\to\infty} \frac{a^n}{n!} = 0 \quad (a \in \mathbb{R}) \qquad \lim_{n\to\infty} \frac{\log n}{n^p} = 0 \quad (p > 0)$$

$$\lim_{n\to\infty} \left(1 + \frac{a}{n}\right)^n = \mathrm{e}^a \quad (a \in \mathbb{R}) \qquad \lim_{n\to\infty} \frac{n^p}{a^n} = 0 \quad (p \in \mathbb{R},\ a > 1)$$