Math Notes

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Contents

1   Hyperbolic Functions

$$sinh(x) = \frac{e^x - e^{-x}}{2}$$

$$cosh(x) = \frac{e^x + e^{-x}}{2}$$

2   Trigonometric Formulas

$$cos(a + b) = cos(a)cos(b) - sin(a)sin(b)$$

$$sin(a + b) = cos(a)sin(b) + sin(a)cos(b)$$

3   Arc functions

4   Cross Product

Definition   In 3-dimensional Euclidean space only, the cross product of vectors **a** and **b** is

$$\mathbf{a} \times \mathbf{b} = \begin{pmatrix} a_2 b_3 - a_3 b_2 \\ a_3 b_1 - a_1 b_3 \\ a_1 b_2 - a_2 b_1 \end{pmatrix}$$

Remark   "xia, dafan, shang"

Properties

1. $\mathbf{a} \times \mathbf{b}$ is orthogonal to both $\mathbf{a}$ and $\mathbf{b}$

2. $|\mathbf{a} \times \mathbf{b}| = |\mathbf{a}||\mathbf{b}|sin\theta$. This says that the length $\mathbf{a} \times \mathbf{b}$ equals the area of the parallelogram generated by $\mathbf{a}$ and $\mathbf{b}$.

3. $\mathbf{a} \times \mathbf{b} = -\mathbf{b} \times \mathbf{a}$

4. $(c_1\mathbf{a}_1 + c_2\mathbf{a}_2) \times \mathbf{b} = c_1\mathbf{a}_1 \times \mathbf{b} + c_2\mathbf{a}_2 \times \mathbf{b}$

5. $\mathbf{i} \times \mathbf{j} = \mathbf{k}$ and $\mathbf{j} \times \mathbf{k} = \mathbf{i}$ and $\mathbf{k} \times \mathbf{i} = \mathbf{j}$

6. *Not* associative: $(a \times b) \times c \neq a \times (b \times c)$