

10.4: Matrix Formulation

The dot product can also be written in matrix form. To begin, let's represent vectors as column vectors-that is, 3×1 matrices. We'll define the vectors **A** and **B** as the column vectors

$$\mathbf{A} = \begin{pmatrix} A_x \\ A_y \\ A_z \end{pmatrix}; \quad \mathbf{B} = \begin{pmatrix} B_x \\ B_y \\ B_z \end{pmatrix} \quad (10.4.1)$$

The dot product can then be written

$$\mathbf{A} \cdot \mathbf{B} = \mathbf{A}^T \mathbf{B} = (A_x \quad A_y \quad A_z) \begin{pmatrix} B_x \\ B_y \\ B_z \end{pmatrix} = (A_x B_x + A_y B_y + A_z B_z). \quad (10.4.2)$$

This the the product of a 1×3 row array with a 3×1 column array, which gives a 1×1 result (i.e. a scalar).

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