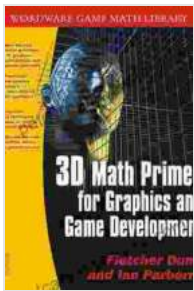


# 3D Math Primer for Graphics and Game Development

3D math is essential for understanding and creating 3D graphics and games. It is used to represent objects in 3D space, transform them, and project them onto a 2D screen. This primer will provide you with the essential mathematical concepts and techniques that you need to know in order to develop 3D graphics and games.



## 3D Math Primer for Graphics and Game Development

by Fletcher Dunn

★★★★☆ 4.1 out of 5

Language : English  
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Screen Reader : Supported  
Print length : 846 pages  
X-Ray for textbooks : Enabled



## Basic Linear Algebra

Linear algebra is a branch of mathematics that deals with vectors, matrices, and transformations. These concepts are essential for understanding how 3D objects are represented and manipulated in computers.

**Vectors** are mathematical objects that have both magnitude and direction. They can be used to represent points in space, directions, and forces.

**Matrices** are rectangular arrays of numbers. They can be used to represent transformations, such as rotations, translations, and scaling.

**Transformations** are operations that change the position, orientation, or scale of objects. They can be represented by matrices.

### **3D Coordinate Systems**

In order to represent 3D objects in a computer, we need to define a coordinate system. A coordinate system is a set of three axes (x, y, and z) that intersect at a single point (the origin). The x-axis points to the right, the y-axis points up, and the z-axis points towards the viewer.

Objects can be represented in a coordinate system by specifying their position (x, y, z) and their orientation (rotation and scale). A rotation matrix can be used to rotate the object around the x, y, or z axis. A scale matrix can be used to scale the object in the x, y, or z direction.

### **Transformations**

Transformations are operations that change the position, orientation, or scale of objects. Transformations are represented by matrices.

There are three types of transformations:

- **Rotation:** Rotates the object around the x, y, or z axis.
- **Translation:** Moves the object in the x, y, or z direction.
- **Scaling:** Scales the object in the x, y, or z direction.

Transformations can be combined to create more complex transformations. For example, a rotation matrix can be combined with a translation matrix to move and rotate the object at the same time.

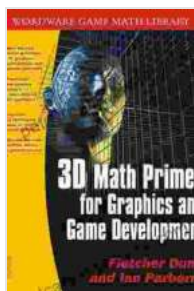
## Projections

Projections are used to project 3D objects onto a 2D screen. There are two types of projections:

- **Orthographic projection:** Projects the object directly onto the screen.
- **Perspective projection:** Projects the object onto a plane that is located in front of the camera.

Perspective projection creates a more realistic image than orthographic projection, but it is also more computationally expensive.

This primer has provided you with a basic understanding of the mathematical concepts and techniques that are used in graphics and game development. In order to learn more about 3D math, I recommend that you read more articles and books on the subject. You can also find many online tutorials that can help you to learn 3D math.



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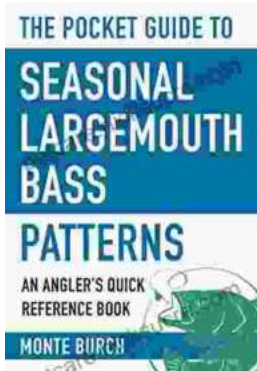
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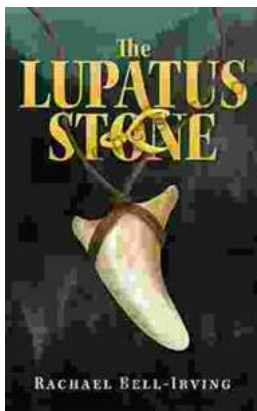
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