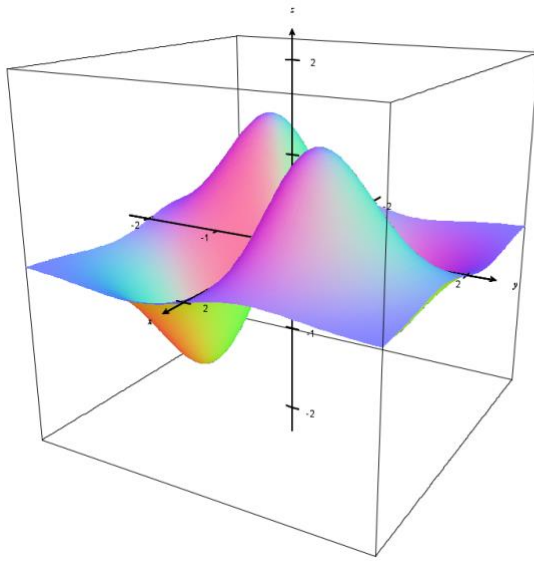
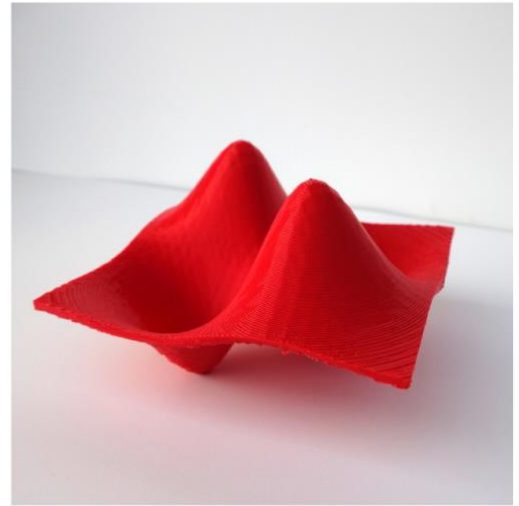


# 3D GAMES

## Mathematics for 3D Games



$$z = \frac{7xy}{x^2 + y^2}$$



**Muhammad Basit**

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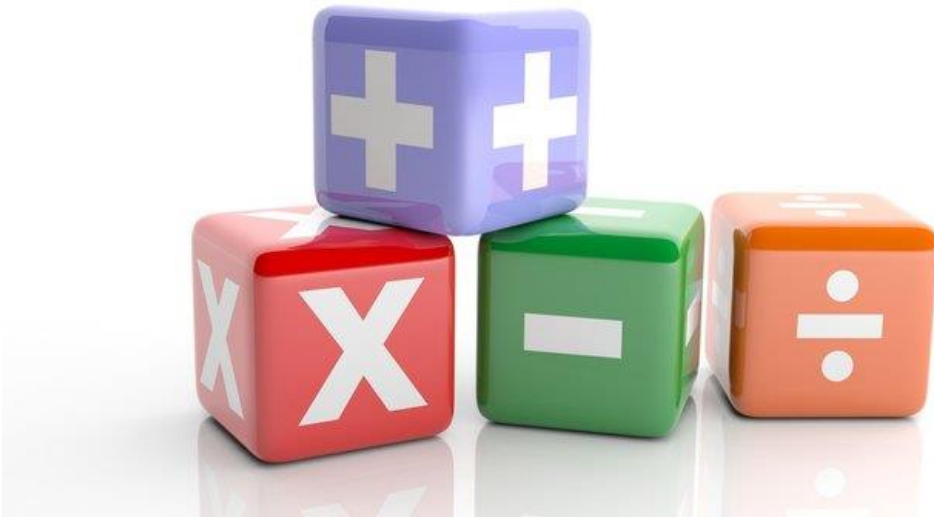
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- Vector operations (addition, subtraction, scalar multiplication)

- Vector normalization

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- Geometric interpretations

- Applications to lighting and physics in games

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- Matrix representation of transformations (translation, rotation, scaling)

- Matrix multiplication and inversion

- Homogeneous coordinates

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- Combining transformations into a single matrix

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- Intersection of lines and planes
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- Why quaternions are used for rotations in 3D

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- Applications in simulating forces like gravity, wind, and friction

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- Force, mass, and acceleration

- Simulating real-world physics in games

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- Conservation of momentum in collisions

- Calculating impulses and applying them in collision responses

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- Mathematical methods for detecting collisions between objects

- Solving for responses after collisions using vectors and matrices

Rigid Body Dynamics:

- Simulating rotational and translational motion of rigid bodies

- Moment of inertia and angular momentum



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Understanding distributions (normal, uniform) and their applications in games

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## **EMPHASIS CAPSTONE PROJECTS ..... 12**

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Developing a small 3D game using all learned mathematical concepts

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## **EMPHASIS RECOMMENDED RESOURCES ..... 13**

Books:

“Mathematics for 3D Game Programming and Computer Graphics” by Eric Lengyel

Courses:

Online courses focusing on game math (Khan Academy, Coursera)