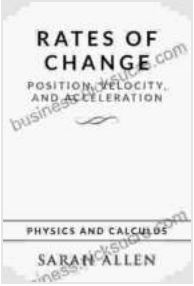
Rates of Change: Position, Velocity, and Acceleration

In physics, the concept of "rate of change" is fundamental to understanding the motion of objects. Three key rates of change in kinematics are position, velocity, and acceleration.



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by Sarah Allen

4.2 out of 5

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Screen Reader	: Supported
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Word Wise	: Enabled
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This article will provide a detailed explanation of rates of change, including their definitions, formulas, and real-world examples.

Position

Position is the location of an object in space. It can be described by a single number (e.g., distance from a fixed point) or by a vector (e.g., coordinates in a coordinate system).

The rate of change of position is called **velocity**.

Formula for Velocity

The formula for velocity is:

velocity = displacement / time

where:

* displacement is the change in position * time is the time interval over which the displacement occurs

Units of Velocity

The SI unit of velocity is meters per second (m/s). Other common units of velocity include kilometers per hour (km/h) and miles per hour (mph).

Example of Velocity

A car traveling at a constant speed of 60 km/h covers a distance of 120 km in 2 hours. The car's velocity is:

velocity = displacement / time = 120 km / 2 h = 60 km/h

Velocity

Velocity is the rate of change of position. It describes how quickly an object is moving and in which direction.

The rate of change of velocity is called **acceleration**.

Formula for Acceleration

The formula for acceleration is:

acceleration = change in velocity / time

where:

* change in velocity is the difference between the final and initial velocities * time is the time interval over which the change in velocity occurs

Units of Acceleration

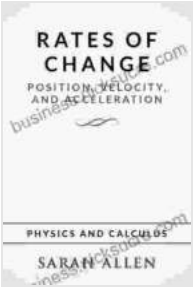
The SI unit of acceleration is meters per second squared (m/s^2). Other common units of acceleration include kilometers per hour squared (km/h^2) and miles per hour squared (mph^2).

Example of Acceleration

A car accelerates from rest to a speed of 60 km/h in 10 seconds. The car's acceleration is:

acceleration = change in velocity / time = (60 km/h - 0 km/h) / 10 s = 6 m/s^2

Rates of change are fundamental concepts in kinematics. Velocity and acceleration are two key rates of change that describe the motion of objects. Understanding these concepts is essential for understanding the behavior of objects in motion.



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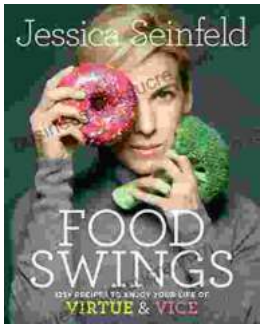

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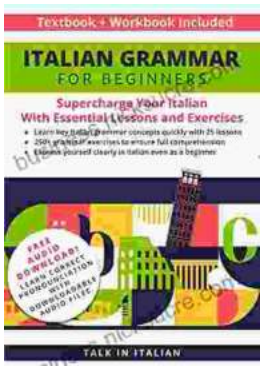

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