

The background is a light gray gradient. It features several realistic water droplets of various sizes, some with highlights and shadows, scattered across the frame. In the upper center, there is a faint, circular, textured pattern that resembles a ripple or a lens flare.

MOTION REVIEW

ALONG A LINE

USE DERIVATIVES AND INTEGRALS TO GO BETWEEN

$x(t)$ or $s(t)$

Position

$$x'(t) = v(t)$$

Velocity

$$x''(t) = v'(t) = a(t)$$

Acceleration

$$x'''(t) = v''(t) = a'(t)$$

Jerk

CALCULATOR EXAMPLE

A PARTICLE TRAVELS ALONG THE X-AXIS.

ITS ACCELERATION IS GIVEN BY $a(t) = \frac{e^x}{3x^2+4}$.

IF THE VELOCITY OF THE PARTICLE AT $T = 2$ IS 7, FIND THE VELOCITY AT $T = 5$.

VELOCITY IS BOTH SPEED AND DIRECTION

$v(t) = 0$ particle is at rest

$v(t) > 0$ *moving right* (or up)

$v(t) < 0$ *moving left* (or down)

SPEED

- $|v(t)| = \text{SPEED}$
- SPEED INCREASES WHEN VELOCITY AND ACCELERATION HAVE THE SAME SIGN

DISPLACEMENT VS. TOTAL DISTANCE

- $\int_{t_1}^{t_2} v(t) dt = s(t_2) - s(t_1)$ DISPLACEMENT-
HOW FAR YOU END UP AWAY FROM STARTING POINT
(CAN BE POSITIVE OR NEGATIVE DEPENDING ON WHAT
SIDE OF THE STARTING POINT YOU END UP)
- $\int_{t_1}^{t_2} |v(t)| dt =$ TOTAL DISTANCE TRAVELED
(ALWAYS POSITIVE)

MAXIMUM VALUE

- TO FIND MAX VALUE, SET FIRST DERIVATIVE EQUAL TO ZERO.
- TO FIND MAX/MIN HEIGHT (FARTHEST TO THE RIGHT/LEFT), SET FIRST DERIVATIVE OF POSITION, WHICH IS VELOCITY, EQUAL TO ZERO. THAT IS THE TIME THE PARTICLE CHANGES DIRECTION.
- TO FIND MAX/MIN VELOCITY, SET FIRST DERIVATIVE OF VELOCITY, WHICH IS ACCELERATION, EQUAL TO ZERO.