MOTION REVIEW

ALONG A LINE

USE DERIVATIVES AND INTEGRALS TO GO BETWEEN

$x(t)\ or\ s(t)$	Position
$x'(x) = v(t)$	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

- $|v(t)|$ = 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.