Using a Physics Example to make some Calculus Conclusions!

If s(t)=position function → m / sec

v(t)=velocity function → $\frac{m}{sec}$ / sec

a(t)= acceleration function → $\frac{\frac{m}{sec}}{sec}$ / sec

$v(t) = s'(t)$

$a(t) = v'(t) = s''(t) = \frac{d^2s}{dt^2} = D_t^2 s$

What is the relationship between all three?

$d\left(\frac{ds}{dt}\right)$

Lucas
Calculus
Rectilinear Motion

Name_____

Consider a particle in rectilinear motion (motion along a line). If it is located to the LEFT of the origin, its position is negative. Likewise if it is RIGHT of the origin, it would have a positive position. Lets(t) be position at time t.

Recall : s'(t)=v(t) and v'(t)=a(t) ★

Consider the following four scenarios and determine

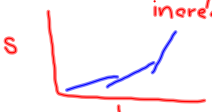
a) which direction (left or right) the particle is moving
b) if it is speeding up or slowing down.

pos. inc.

a) b)

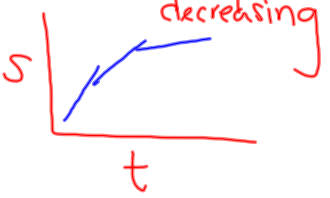
1) v(t)>0 and a(t)>0 moving right speeding up

velocity increasing



2) v(t)>0 and a(t)<0 moving right slowing down

position increas. velocity decreasing



Consider the following four scenarios and determine

a) which direction (left or right) the particle is moving
b) if it is speeding up or slowing down.

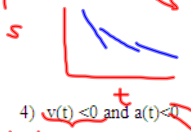
a) b)

moving left slowing down

3) v(t)<0 and a(t)>0

vel. neg velocity increasing

pos. dec



$-3\frac{m}{sec}$ $-2\frac{m}{sec}$

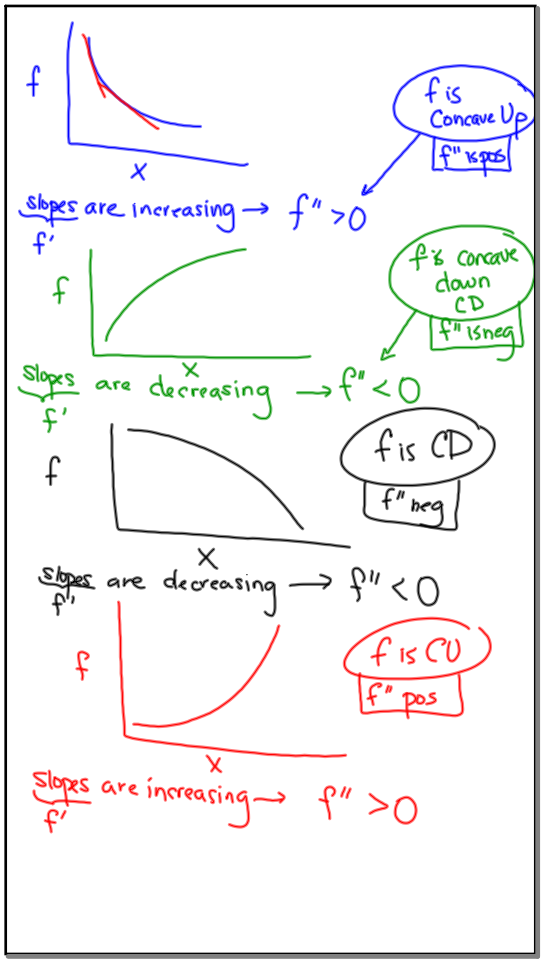
think w/numbers sometimes

4) v(t)<0 and a(t)<0 moving left speeding up

Velocity neg

Velocity decreasing

$-3m/sec \ldots -4m/sec$



General conclusions regarding the graph and the second derivative.

Notations for second derivative:

Prime

Differential Operator

Leibniz