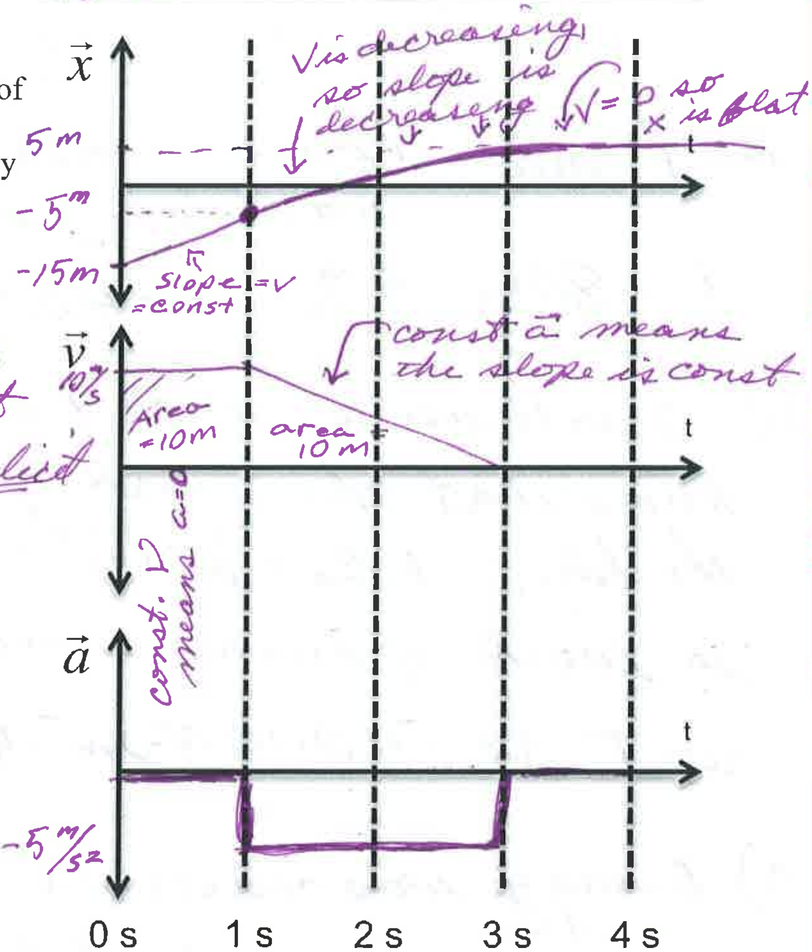
Big Exam #1, Physics 141 Schwartz, W2016, Name Pete

1) My mass is 70 kg, and the mass of my bike is 10 kg. I'm riding my bike at a constant speed of 10 m/s. However, at exactly t = 1s, my displacement is -5 m and I see a car and I apply a constant force, and slow to a stop over a period of two seconds. Please graph my acceleration, velocity, and displacement as a function of time. Label the axes correctly.



This is a straight up Kinematecs lens because we are looking at variables of motion as an explicit function of time.

a little (dynamics) F = ma, because F is constant, a must be constant.

$a = \frac{\Delta V}{\Delta t} = \frac{-10\ m/s}{2\ s} = -5\ m/s^2$

because I know speed decreases at a constant rate, the $\vec{V}$ graph is a straight line between 1s + 3s, but the slope of the $\vec{x}$-t graph must decrease. the area under the $\vec{V}$-t graph is the change in $\vec{x}$.

2) In the last problem, please find

a) The force exerted by my breaks

b) The work done by my breaks and the average power.

c) Was energy conserved in this process? How?

a) $\vec{F} = m\vec{a}$ Forces because I know the $\vec{a}$ + I want to know the force.

$F = 80kg \cdot -5 \, m/s^2 = -400 \, m/s^2$

b) I will use a work + energy lens because I know that the work of the breaks = ΔKE of the bike. $KE_0 = \frac{1}{2} m V_0^2 = \frac{1}{2}(80kg)(10 \, m/s)^2 = 4000 J$

so work of breaks must $= -4000 J$, let's check:

$W = F \cdot \Delta x = -400N \cdot 10m = -4000 J$ good!

c) Energy was conserved! the friction of the breaks turned the bike's KE into Heat (molecular, random Kinetic Energy)