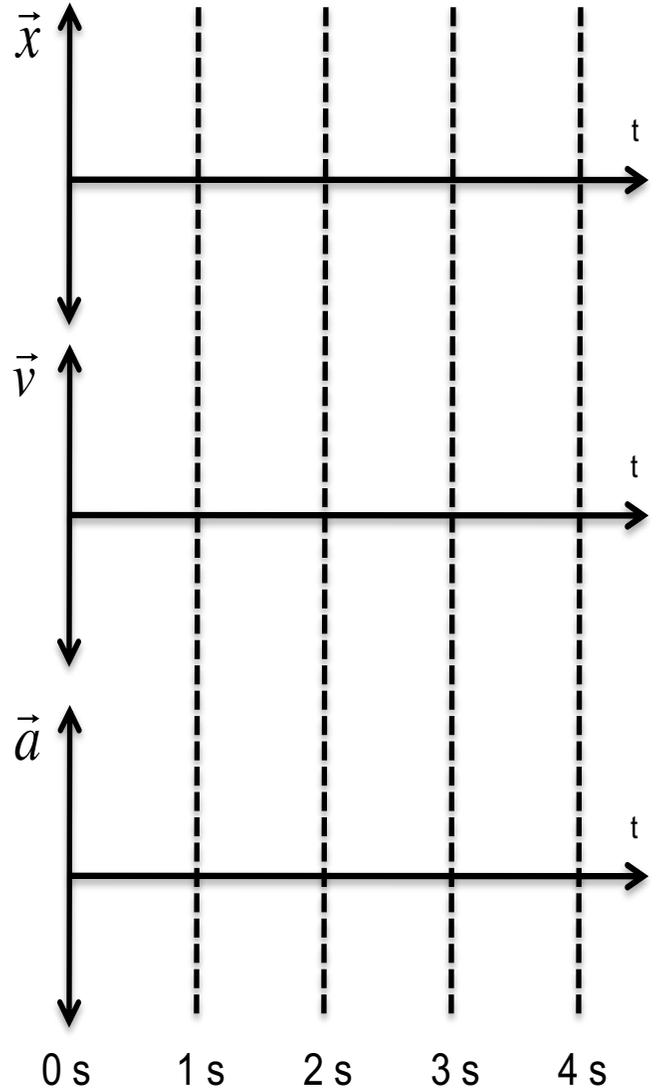


You will be graded on your communication of physics understanding.

#2 Your friend has a mass of 50 kg and is standing on a scale inside a 1000 kg elevator.

At a height of 20 m ( $t = 0$ ) she notices that she's moving upwards with constant speed 8 m/s. She continues at this speed for 1 second and then comes to rest at a rate of  $4 \text{ m/s}^2$ . Please make the graphs describing her motion. Label the axes to make the values explicitly clear and show what her final height is if you can. The horizontal axes do not have to indicate  $y = 0$ . *Hopefully you've made a good drawing or drawings showing the sequence of events and explained why you chose a kinematics lens. Do you find she stops at 36 m?*



#2 In the problem above what does the scale your friend is standing on read at  $t = 0$ , and at  $t = 2$  s. Remember to show your work and thought process completely. Think of convincing someone who is skeptical. *I myself, personally got an "F" on this problem for not being careful... I was supposed to ask you for the acceleration at  $t = 2$ s. At  $t = 3$  s, the acceleration changes so you really can't do the problem... for the corrections please do the problem at  $t = 2$ s. Hopefully, you've drawn a good picture and explained why you chose a dynamics lens. Did you remember to diagram the vector addition of the forces? Is the normal force of the scale greater than, less than, or equal to the force of gravity on her (a) when she is moving upward at constant velocity, (b) when she's slowing down?*

#3 Jane (50 kg) is glad to see Tarzan (100 kg) and is running toward him at 5 m/s to give him a big hug. He is standing in a tree 5 m above the ground and swings down in the opposite direction to hug her. **Ka-smack!** They hit each other just as Tarzan reaches the ground, and they swing off together.

- a) Please explain exactly how you would calculate the final speed of these two people holding the vine (and each other).
- b) Please also set up the equations.
- c) If you are able, please find their final speed indicating direction.

*Hopefully, you took the time to make a few diagrams showing the sequence of events. Did you recognize that we'll need two lenses to solve the whole problem? I got that their final speed was 5 m/s, in which direction?*

#4 Your friend is on a sled (combined mass: 100 kg) moving at a speed of 2 m/s on flat, smooth snow. To speed him up, you push him forward with a force of 200 N over 8 m.

- a) Please find my friend's final speed after I am done pushing him.
- b) Explain how you would estimate the average power I put out as I push him. You don't have to calculate it.
- c) *To shorten the exam I dropped this part, but please do it for the corrections... because it's lovely:* Let's say that for the last 4 m of the 8 meters I pushed, we ran over a rough patch with a coefficient of friction of 0.1 between the snow and the sled. How would this change the problem? If you can, find the new final speed.

*Hopefully, you've made a good diagram explaining what's happening. You might explain why you'd use a dynamics lens... but it would get complicated and require some kinematics. Then you might try an energy lens instead to solve part a. I got a final velocity of 6 m/s, and using an energy lens for (b) an average power of 800 W. For friction, can you show how this consideration would result in a final speed of just a little more than 5 m/s.*

Name \_\_\_\_\_