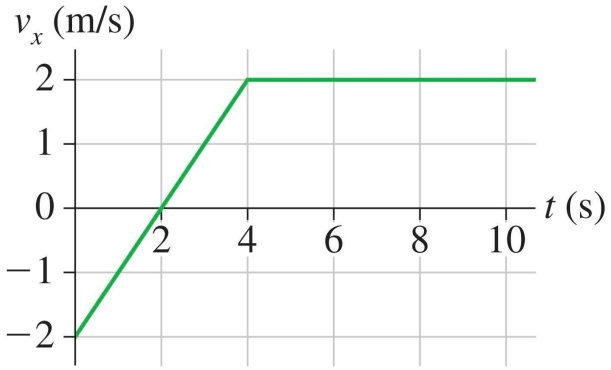
Physics 151
Homework Assignment #2
Due June 13

#1 The figure shows the velocity-versus-time graph for a train that starts from the origin at $t = 0\,s$.

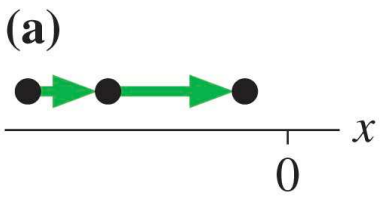


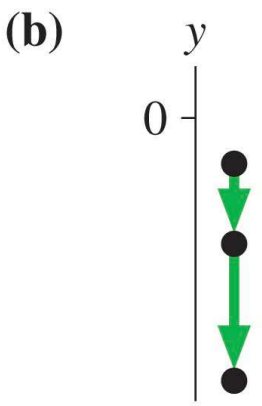
(a.) Draw the train's position-versus-time graph. (Your graph must have the correct position values on it for full points.)

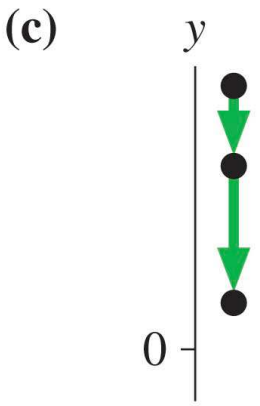
(b.) what is the train's acceleration at $t = 2\,s$?

(c.) what is the train's acceleration at $t = 6\,s$?

#2 For each of the motion diagrams shown, determine the sign of the position, velocity, and acceleration.







#3 Does a real-life automobile have a constant acceleration? Given is measured data for a Porsche 944 Turbo at maximum acceleration.

$t(s)$	$v_x(mph)$
0	0
2	28
4	46
6	60
8	70
10	78

(a.) Convert the velocities to m/s and then make a graph of velocity versus time. Based on your graph, is the acceleration constant? Explain.

(b.) Draw a smooth curve through the points on your graph, then use your graph to *estimate* the car's acceleration at $2.0\,s$ and $8.0\,s$. Give your answers in SI units.

#4 When jumping, a flea reaches a takeoff speed of $1.5\,m/s$ over a distance of $0.25\,mm$. After this "jump phase", the flea will then be in free fall. (Ignore air resistance for this problem.)

(a.) What is the flea's acceleration during the jump phase?

(b.) How long does the jump phase last?

(c.) How high will the flea go? (In reality, air resistance will play a large role here, and the flea will not actually reach this height.)

#5 Divers compete by jumping into a 2-m-deep pool from a platform $9\,m$ above the water. What is the minimum acceleration (assumed constant) needed to keep the diver from hitting the bottom of the pool? Ignore air resistance and make down to be negative. For full points, your answer must have the correct sign.

#6 A juggler throws a ball straight up into the air with a speed of $8\,m/s$. With what speed would she need to throw a second ball half a second later, starting from the same position as the first, in order to hit the first ball at the top of the first ball's trajectory.

#7 A "rocket car" is launched along a straight track with a constant acceleration of $2.5\,m/s^2$. After $2\,s$, a second car is launched (at the same place where #1 started) along a parallel track with a constant acceleration of $6.4\,m/s^2$.

(a.) How long does it take the second car to catch the first one? Find the elapsed time from when the second car is launched.

(b.) How far have the cars traveled when the second passes the first?