tEST--Summer Assignment

Directions: Answer each of the following questions being sure to:

1.) Put your full name in the upper right-hand corner of the first page;
2.) Number each question appropriately;
3.) Draw diagrams when necessary;
4.) Show all work, include BLURBS when necessary;
5.) Show kinematic equations used before putting in numbers;
6.) Include units with results;
7.) Box your results.

With 10 minutes left in the period, stop working and:

1.) Put your handwritten pages in numeric order;
2.) Scan those pages into a PDF file with the filename "lastname,firstname-test1.pdf"
3.) Submit that packet to your Google Classroom account. (Note that the generic Google Classroom site for the class is at Google Classroom, though if you have a URL that is specific to your account, you should use that . . .)

Question:

1. (20 pts) The velocity of an object moving along the x-axis in m/s as a function of time t is given by the equation $-8.0t + 12t^3$. Assume the body is at the origin at t = 0.
   a.) Just after t = 0, is the body moving in the positive or negative direction?
   b.) AFTER t = 0, the body reverse its direction? When does that happen?
   c.) What is the body's acceleration at t = 2 seconds?
   d.) Where is the body at t = 2 seconds?

2. (12 pts) An untethered stunt woman is climbing the side of a building when she loses her grip and begins to free fall in the vertical, accelerating with a magnitude of $9.8\ m/s^2$. Describe her velocity vector and position vector as she free falls. Don't get hung up on extensive math here, but do talk about everything that is important to know about a vector. Be succinct.

3. (10 pts) Given a particle's non-constant acceleration of $a = 4kt^2$, where a is in m/s^2 and the magnitude of k is 1.
   a. What are the units for k?
   b. If the velocity at t = 1 second is in the negative direction with a magnitude of 2 m/s, is the body speeding up or slowing down at that point?

4.) (18 pts) A dragster can run a 400 meter track (approximately quarter mile) in 3.5 seconds. Assuming acceleration is constant throughout the motion:
   a.) What is the dragster's acceleration?
   b.) How fast is the dragster moving after the first 100 meters?
   c.) How long does it take for the dragster to reach 200 m/s?

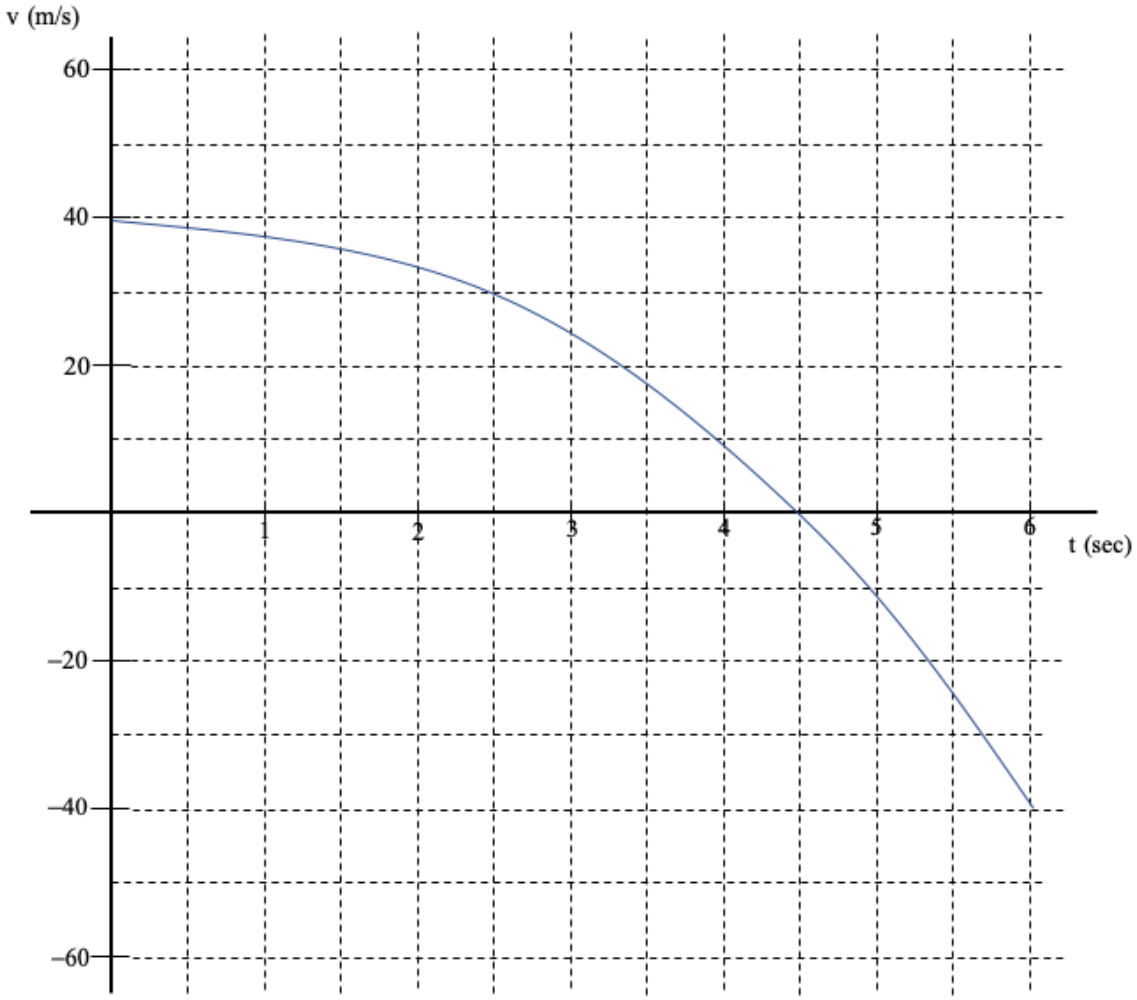
5.) (20 pts) The object passes through the origin at t = 0. A sketch of its velocity as a function of time graph is shown below.

a.) Determine the body's approximate acceleration at t = 4.5 seconds.

b.) At what time, if any, does the body's motion change direction.

c.) During the interval shown, at approximately what time does the body get back to the origin, if every?

d.) Sketch an approximate *position vs time* graph for the body's motion during the first two seconds. Label your coordinate axes and provide a few values.



6.) (20 pts) A rocket accelerates from rest upward at a rate of 7 m/s^2. It does this for 8 seconds. At the end of that period, the engine cuts out and the rocket continues upward in "free fall." Ignoring air friction and presenting the kinematic equation you intend to use in each instance:

a.) How high will the rocket travel, total? (Hint: one of the "later" things you'll need to do is determine the velocity of the rocket at cut-out.)

b.) How much time will it take to get back down to the ground? (note that the velocity when the body gets to the ground will NOT be zero)