1. For **motion at constant positive velocity**,  
   
   (a) [1 pt] translate the description of the motion into your own, simpler words that describe how you would have to move to produce this motion. If it is not possible to produce this motion, explain why not.
   
   (b) [2 pt] sketch $a$ versus $t$, $v$ versus $t$, and $s$ versus $t$ graphs, one directly under the other.
   
   (c) [2 pt] draw a picture of a track and a ball such that the ball will move with the corresponding motion. Indicate on your diagram:
      
      i. the initial position and initial direction of motion of the ball,
      ii. the location of $s = 0$, and
      iii. the positive direction.
2. Cars A and B travel in the same direction along the same straight road in the following manner: Car A is located at position \( s_A \) mi at clock reading \( t_A = 0.00 \) hr and maintains a constant velocity \( v_A \) mi/hr. Car B is located at \( s_B = 0.0 \) mi at clock reading \( t_B > 0.00 \) hr (that is, after car A is at position \( s_A \)) and maintains a constant velocity \( v_B \) such that \( | v_B | > | v_A | \) (that is, car B is going faster than car A).

(a) [2 pt] At what clock reading will car B catch up to car A?
(b) [2 pt] At what position will the catching up take place?
(c) [0.5 pt] How long after being at \( s_B = 0.0 \) mi will it take car B to catch up to car A?
(d) [0.5 pt] How far will car A have traveled from its position at \( t_A = 0.00 \) hr to the place where car B catches up to it?

Solve these problems in two different ways: 1) Plot the two \( s \) versus \( t \) histories on the same diagram and indicate the points or segments that correspond to the answers, and 2) write down two equations, one for each car, for \( s \) as a function of \( t \), then solve them simultaneously for the unknown quantities using basic algebra.

3. [5 pt] A simple way to test the reaction time of a friend without a stopwatch is to hold a new dollar bill vertically at its upper edge such that the bottom edge of the bill is between your friend’s thumb and pointer, neither of which is touching the bill. You release the bill at some instant your friend cannot anticipate. Your friend should try to grasp the bill as soon as possible. Develop a formula relating \( s \), the distance from the bottom edge to the point where the bill is grasped, and \( t \), the reaction time.

4. [5 pt] For a projectile launched horizontally, derive the equation \( R = v_0 t \sqrt{2H/g} \), where \( H \) is the distance below the level at which the projectile was launched, and \( R \) is the horizontal range of motion, by rearranging and appropriately re-identifying variables in \( y = -\left(\frac{x}{2v_0^2}\right)x^2 \).