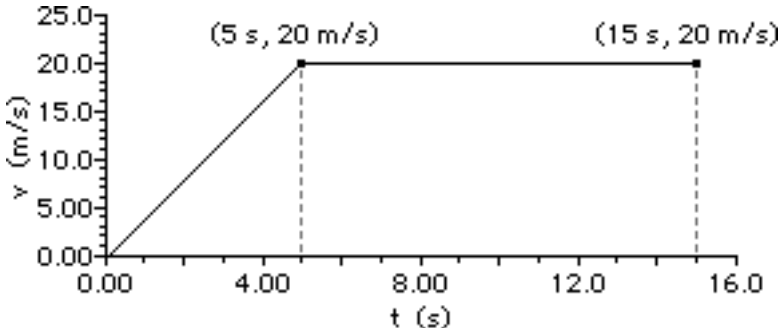
Kinematic Graphing - Mathematical Analysis

Study **Lessons 3 and 4** of the **1-D Kinematics** chapter at **The Physics Classroom**:
http://www.physicsclassroom.com/Class/1DKin/1KinTOC.html

1. Consider the following graph of a car in motion. Use the graph to answer the questions.



a. Describe the motion of the car during each of the two parts of its motion.

0-5 s: _____

5-15 s: _____

b. Construct a *dot diagram* for the car's motion.

c. Determine the acceleration of the car during each of the two parts of its motion.

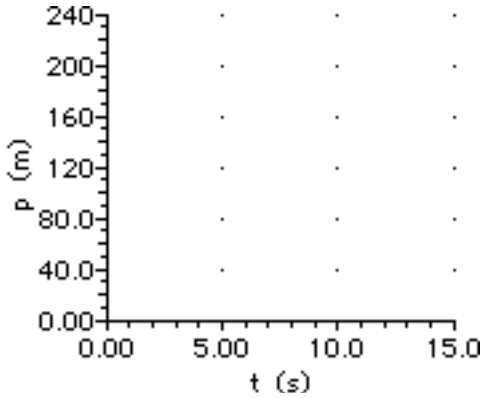
0-5 s 5-15 s

d. Determine the displacement of the car during each of the two parts of its motion.

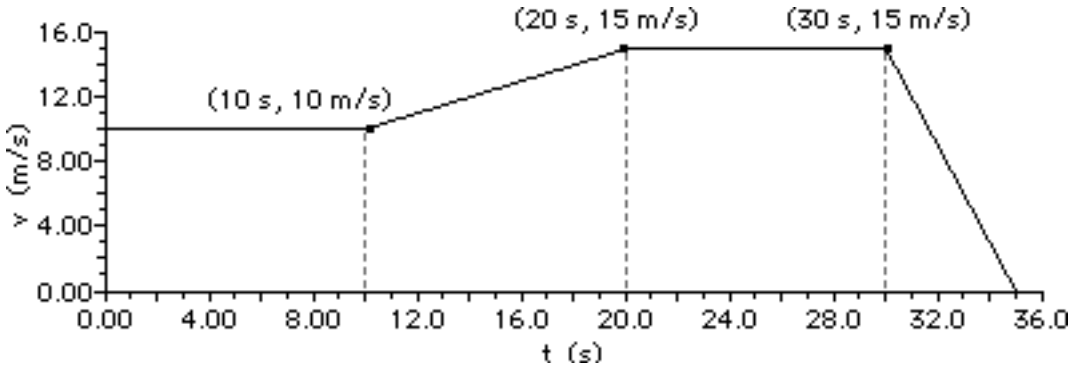
0-5 s 5-15 s

e. Fill in the table and sketch position-time for the car. Give particular attention to how you connect coordinate points on the graphs (curves vs. horizontals vs. diagonals).

Time (s)	Pos'n (m)
0	0
5	
10	
15	



2. Consider the following graph of a car in motion. Use the graph to answer the questions.



a. Describe the motion of the car during each of the four parts of its motion.

0-10 s: _____

10-20 s: _____

20-30 s: _____

30-35 s: _____

b. Construct a *dot diagram* for the car's motion.

c. Determine the acceleration of the car during each of the four parts of its motion. **PSYW**

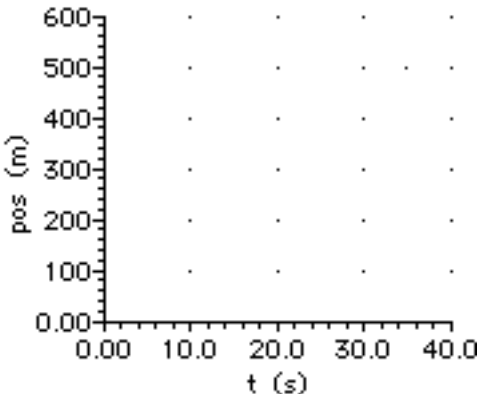
0-10 s	10-20 s	20-30 s	30-35 s

d. Determine the displacement of the car during each of the four parts of its motion. **PSYW**

0-10 s	10-20 s	20-30 s	30-35 s

e. Fill in the table and sketch position-time for this car's motion. Give particular attention to how you connect coordinate points on the graphs (curves vs. horizontals vs. diagonals).

Time (s)	Pos'n (m)
0	0
5	
10	
15	
20	
25	
30	
35	



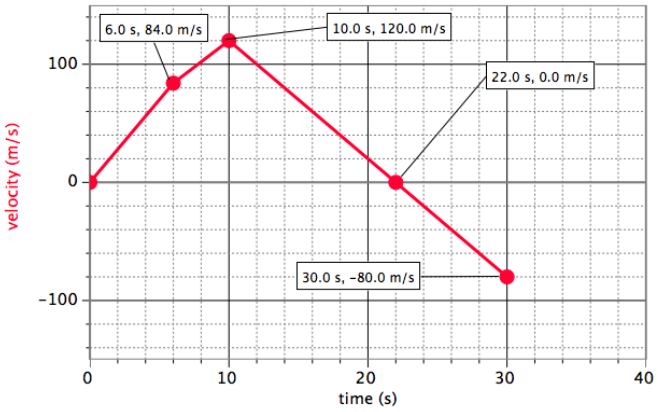
3. Consider the graph at the right for a two-stage, 4th of July rocket. There are two fuel stages – 0.0 to 6.0 seconds and 6.0 to 10.0 seconds. Once the fuel is spent, the rocket is under the sole influence of gravity. The rocket explodes at 28.0 seconds.

   a. Determine the acceleration of the rocket during the time intervals from …
      … 0.0 s to 6.0 s. **PSYW**

      … 6.0 s to 10.0 s. **PSYW**

      … 10.0 s to 22.0 s. **PSYW**

      … 22.0 s to 28.0 s. **PSYW**



   b. Determine the displacement of the rocket during the time intervals from …
      … 0.0 s to 6.0 s. **PSYW**

      … 6.0 s to 10.0 s. **PSYW**

      … 10.0 s to 22.0 s. **PSYW**

      … 22.0 s to 28.0 s. **PSYW**

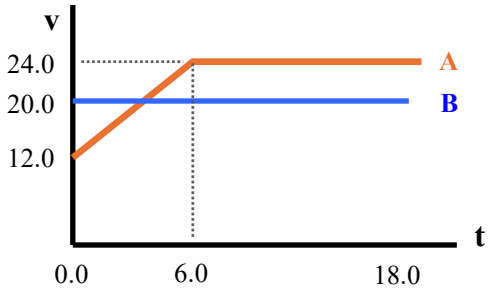
   c. Determine the height of the rocket at a time of …
      … 6.0 seconds: _____ … 10.0 seconds: _____

      … 22.0 seconds: _____ … 28.0 seconds: _____

   d. At what time does the rocket change its direction? _____ seconds

   e. If the rocket continued to fall after the 28.0 second mark, at what time would it land on the ground. **PSYWC (C = Clearly)**

4. The v-t graph at the right represents the motion of two cars on the highway. At t = 0.0 seconds, the two cars are side-by-side (i.e., at the same position). Car A accelerates for 6.0 seconds and then maintains a constant speed. Use the graph to answer the following questions.



   a. How far have the two cars traveled after a time of 6.0 seconds? **PSYWC**

   b. Which car is ahead and by what distance at a time of 6.0 seconds?

   c. At what time are the two cars side by side?

5. The light turns green and car A accelerates from rest at 4.8 m/s/s for 5.0 seconds and then maintains a constant speed. Car B passes Car A when the light turns green and travels with a constant speed of 18.0 m/s/s.

   a. Sketch plots of Car A and Car B in the space at the right. Identify a few strategic coordinates.

   b. Determine how much time it takes Car A to it catch up with Car B. **PSYWC**