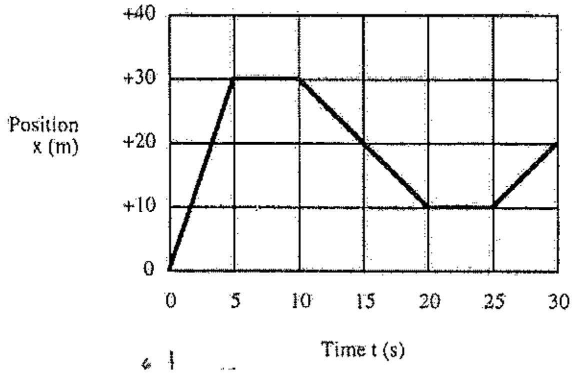
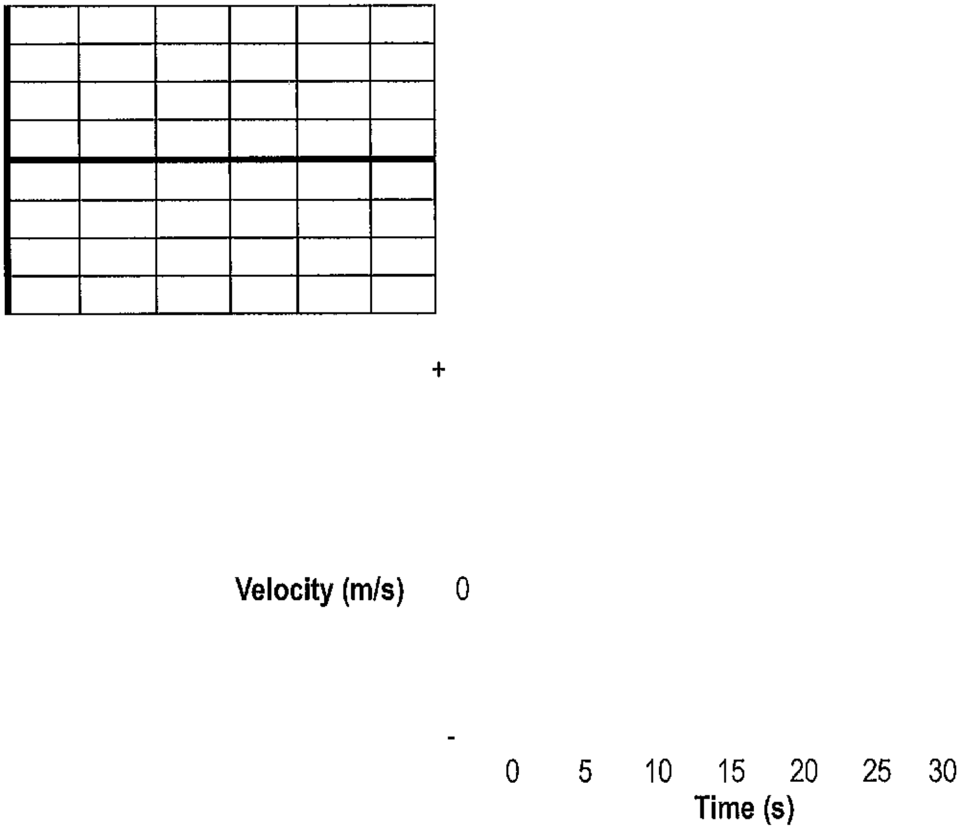
Engineering 1 **Name** ________________________
Problem Set: Evaluating Motion Graphs

A. **Consider the motion given by the position-time graph shown below to answer questions 1 - 9.**

11. Using the position-time graph shown below, draw the corresponding velocity-time graph.



1) Is the object ever at *rest*? _________ If so, when? _______________________________
2) *Where* is the object at the end of this trip? _______________
3) When is the object going the *fastest*? _______________
4) Are there any times during which the object is moving at the same *speed*? __________
   If so, when? ____
5) Are there any times during which the object is moving with the same, (nonzero) *velocity*? __________
   If so, when? ____
6) What is the average *speed* of the object for the **entire** trip? __________
7) What is the average *velocity* for the object for the first 10 seconds? __________
8) What is the *instantaneous* velocity at t = 15 s? _______________
9) Draw the *velocity-time* graph for the same motion illustrated in the position-time graph above.



B. **Consider a new motion ... given by the velocity-time graph shown below ... to answer questions 10 - 17.**

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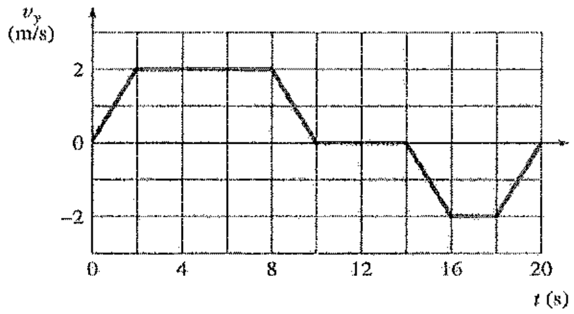
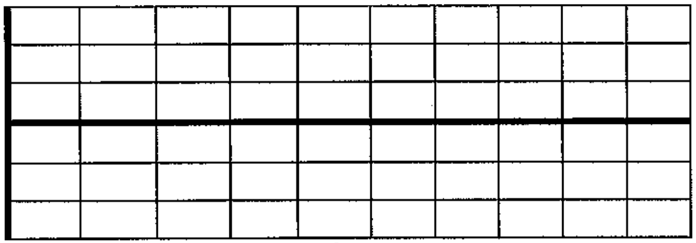
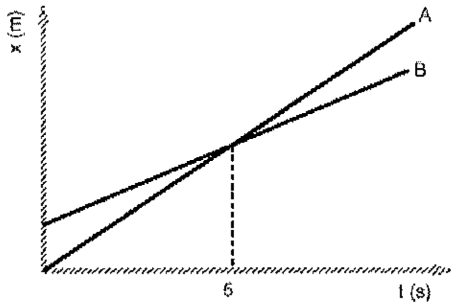


igure 3.30 Problems 3 and 4

10) *When* was the object moving with constant speed? ________________
11) *When* was the object at rest? _______________
12) Was the object ever moving *backwards*? __________ If so, when? ________________________
13) What was the *velocity* of the object at t = 1 s? __________ at t = 5 s? __________
14) What was the *acceleration* of the object during the first 2 s? __________
15) What was the *displacement* for the first 8 s? _______________
16) What was the *displacement* for the entire trip? _______________
17) Draw the *acceleration-time* graph for the same motion represented by the velocity-time graph above.



18) Consider the position-time graph below for two cyclists, Alice and Ben.



a. Do the cyclists start at the same point? ___ If not, which one is ahead at the beginning?

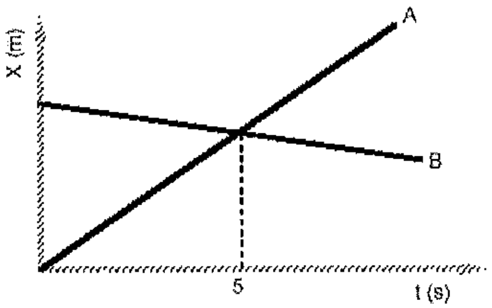
b. At t= 7s, which cyclist is ahead? __________

c. Which cyclist is traveling fastest at 3 s? __________ How do you know?

d. Are the velocities of the two cyclists equal at any time? __

e. Describe the situation at the intersection of lines A and B.

19) Consider the position-time graph below for a different trip made by Alice and Ben.



a. How does the motion of Alice in this graph compare to her motion in the previous graph?

b. How does Ben's motion compare to the previous graph?

c. Which cyclist is traveling the fastest? How do you know?

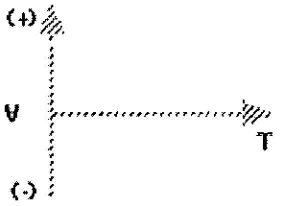
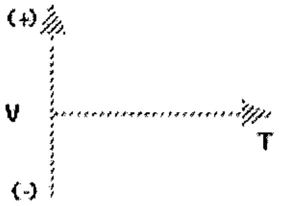
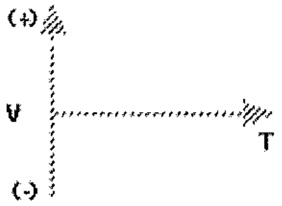
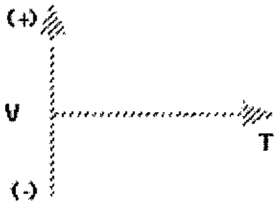
d. Describe what is happening at the intersection of lines A and B.

e. Which cyclist has traveled further during the 5 five seconds? ___

❖ On a position-time graph, speed is represented by: ________________________________

❖ On a position-time graph, direction is represented by: ______________________________

20) Sketch a velocity –time graph that corresponds to each description of the motion of an object.

The object is moving away from the origin at a constant speed.	The object is standing still.	The object moves toward the origin at a steady speed for 10 s, then stands still for 10 s.	The object moves away from the origin at a steady speed for 10 s, reverses direction and moves back toward the origin at the same speed.
			

21) For each position-time graph, describe the motion and draw the corresponding velocity-time graph.

Position-Time Graph	Description of the Motion	Velocity-Time Graph