DeAnza College

Kinematics
Motion in 1-Dimension
Graphs and Problem Solving

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Last time

- graphing kinematic quantities against time

Overview

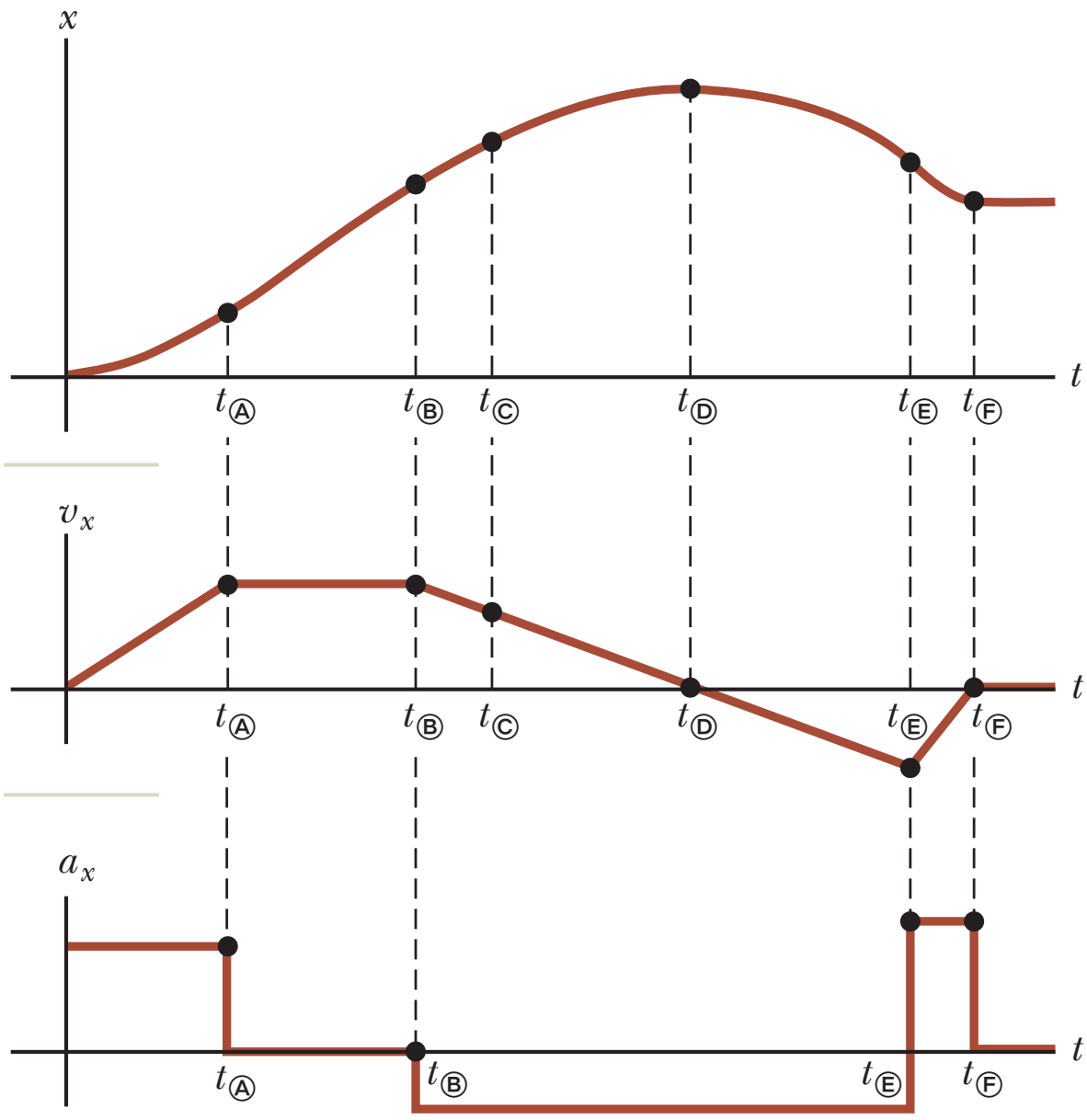
- more about graphs of kinematic quantities vs time
- how to solve problems & using a graph

Reminder: Graphing Kinematic Quantities

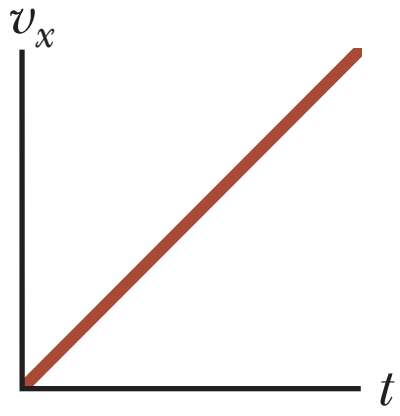
One very convenient way of representing motion is with graphs that show the variation of these kinematic quantities with time.

Time is written along the horizontal axis – we are representing time passing with a direction in space (the horizontal direction).

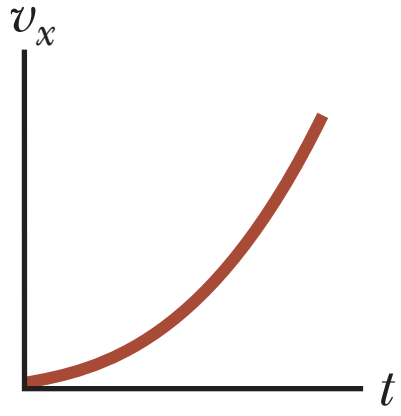
Relating Graphs



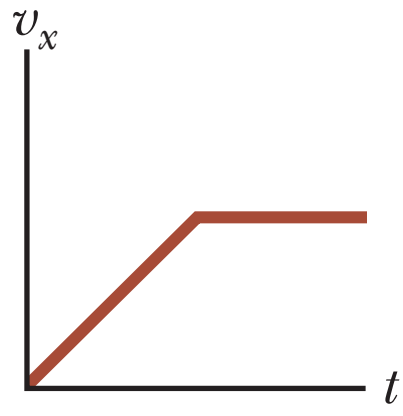
Matching Velocity to Acceleration Graphs



a



b



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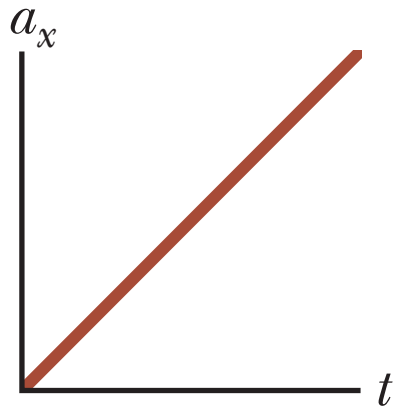

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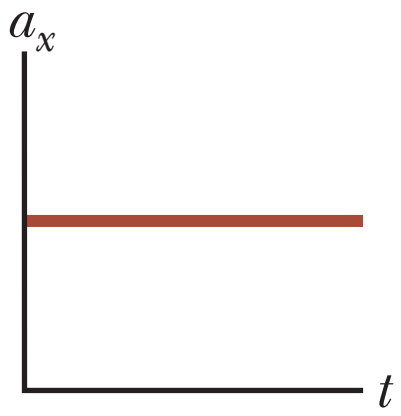

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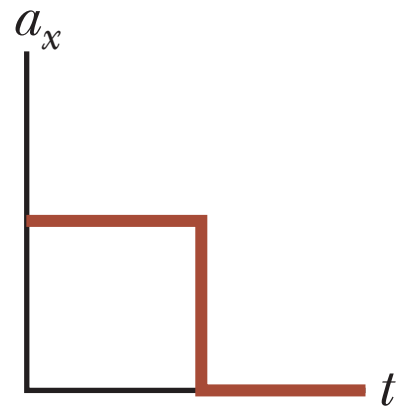
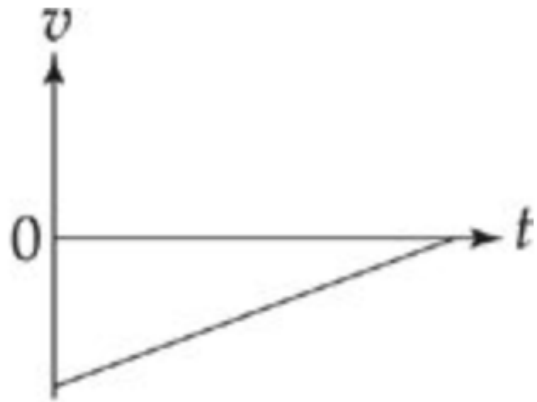


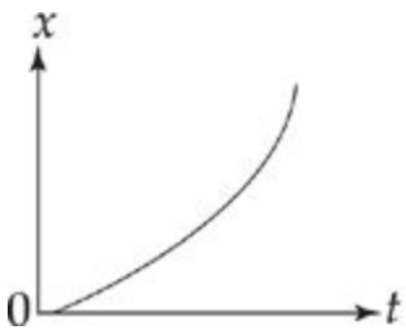
f

More Graph Matching Questions

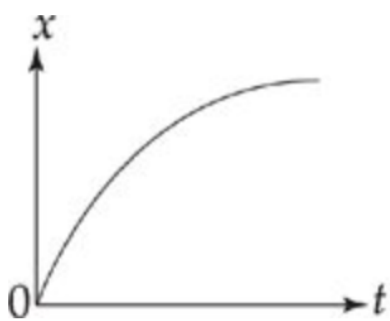
Which of the following position-time graphs corresponds to this velocity-time graph?



A



B



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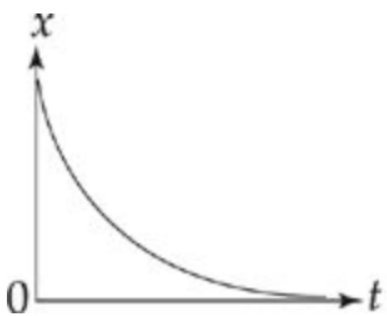
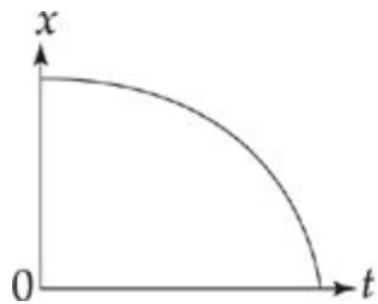


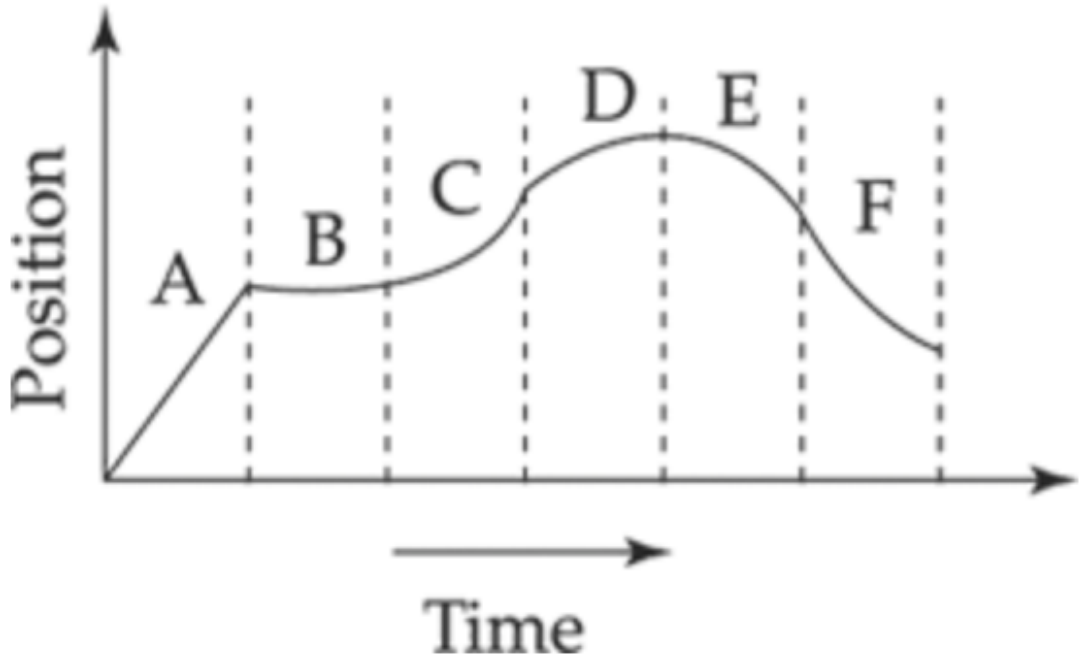
D



[1]Figures from Leduc, "Cracking the AP Physics B Exam" Princeton Review.

More Graph Matching Questions

Sketch the velocity-time graph that corresponds to this position-time graph:



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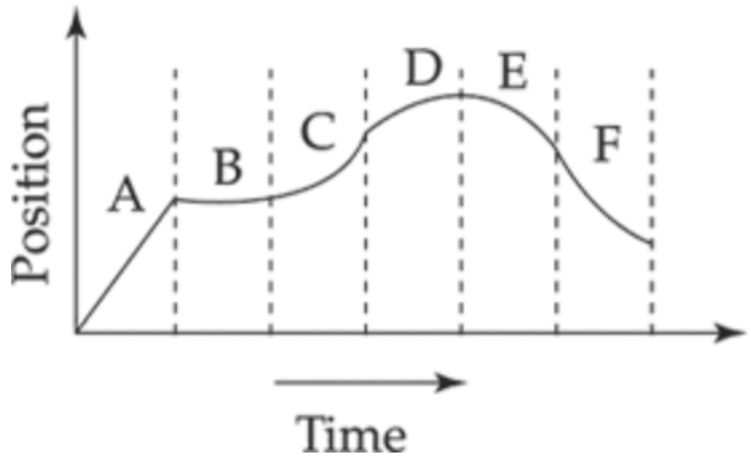

How to solve problems

Solving physics problems is often not simple.

To get into good habits for future work in physics, we will follow a set process.

This process is similar to the process that physicists and engineers go through solving problems, sometimes only mentally, sometimes explicitly.

(Also have a look at the similar process and examples on page 12 of the textbook.)

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4. Analyze answer as appropriate.
   a. Compare answer to hypothesis - if it is not the same try to explain why.
   b. Is your answer reasonable? / Compare to other things your are familiar with.
   c. Consider limits or special cases.

Example 2.5 (from the textbook)

A boat moves slowly inside a marina (so as not to leave a wake) with a constant speed of 1.50 m/s. As soon as it passes the breakwater, leaving the marina, it throttles up and accelerates at 2.40 m/s^2.

(a) How fast is the boat moving after accelerating for 5.00 s?

(b) How far has the boat traveled in this time?

[1] Walker, pg 31.

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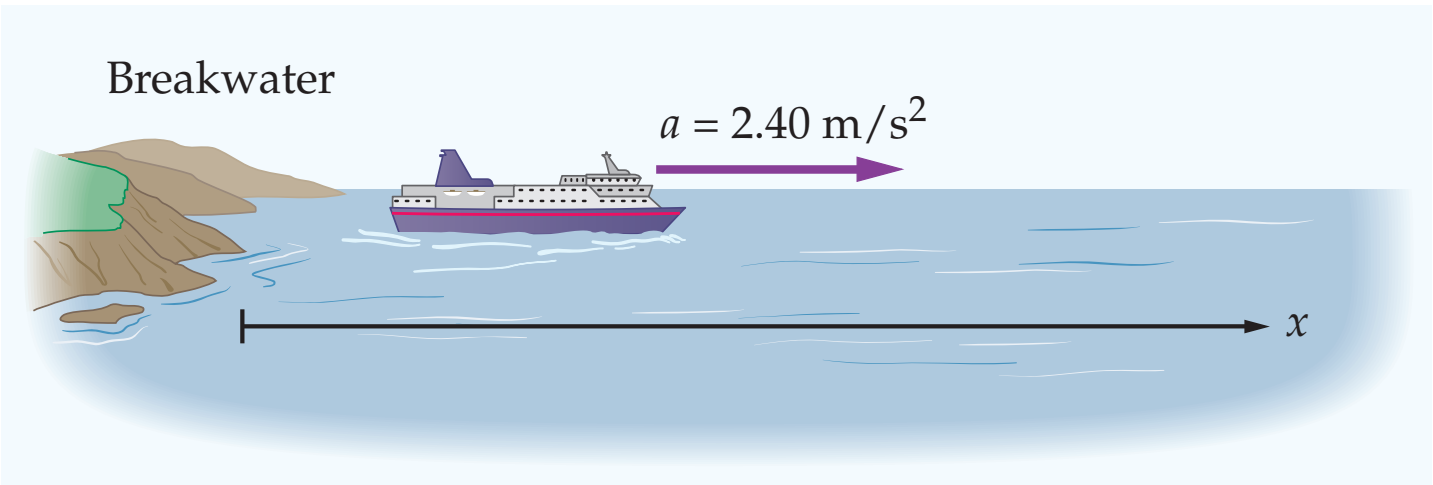
Sketch:



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Hypothesis:

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Hypothesis:
(a) 10 m/s. (Must be bigger than 1.50 m/s, but there's only so fast a boat can go.)

(b) 30 m. If the average speed is about 6 m/s (between 1.50 and 10 m/s) multiply that by 5 s to get 30 m.

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Given: $a = 2.40$ m/s^2, $v_0 = 1.50$ m/s, $t = 5.00$ s
Want: v_f

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Example 2.5

(b) How far has the boat traveled in this time?

Example 2.5

Analyze answers:

Now You Try It

A car is traveling along a straight road at 11 m/s and accelerates at a constant rate of 1.8 m/s^2. How long does it take to reach a speed of 20 m/s?

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Summary

- graphing kinematic quantities

Homework

- graphs multiple choice worksheet, *do on 882-E scantron sheet*, due ?

Walker Physics:

- Ch 2, onward from page 47. Probs: 36*, 37

*Ans for 26: (a) which has the steepest slope?, (b) 1 m/s, (c) 2 m/s, (d) 0.5 m/s