Monday warm-up: Kinematics, II

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1 Memory Bank

1. $v = \frac{\Delta x}{\Delta t}$ ... Average velocity.
2. $v = \frac{dx}{dt}$ ... Instantaneous velocity.
3. $a = \frac{\Delta v}{\Delta t}$ ... Average acceleration.
4. $a = \frac{dv}{dt}$ ... Average acceleration.
5. $x(t) = \frac{1}{2}at^2 + v_i t + x_i$ ... Position versus time, given constant acceleration
6. $v(t) = at + v_i$ ... Speed versus time, given constant acceleration

2 Chapter 2 - Kinematics, II

1. Consider the motion of the system depicted in Fig. 1 (top). Which of the following is true?
   - A: The speed is negative, then positive, then negative again
   - B: The speed is positive, then negative, then positive again
   - C: The speed is positive, then negative
   - D: Cannot determine from Fig. 1 (top).
2. Consider the motion depicted in Fig. 1 (top). Which of the following is true?
   - A: The acceleration is positive, then negative
   - B: The acceleration is negative
   - C: The acceleration is positive
   - D: The acceleration is negative, then positive
3. Suppose a cyclist has a velocity of 15 m s^{-1} at $t = 0$. If the acceleration is 3 m s^{-2}, (a) what is the velocity at $t = 4$ seconds? (b) What is the displacement of the cyclist at $t = 4$ seconds? (c) Is the average velocity different from the instantaneous velocity at $t = 0$ or $t = 4$ seconds?

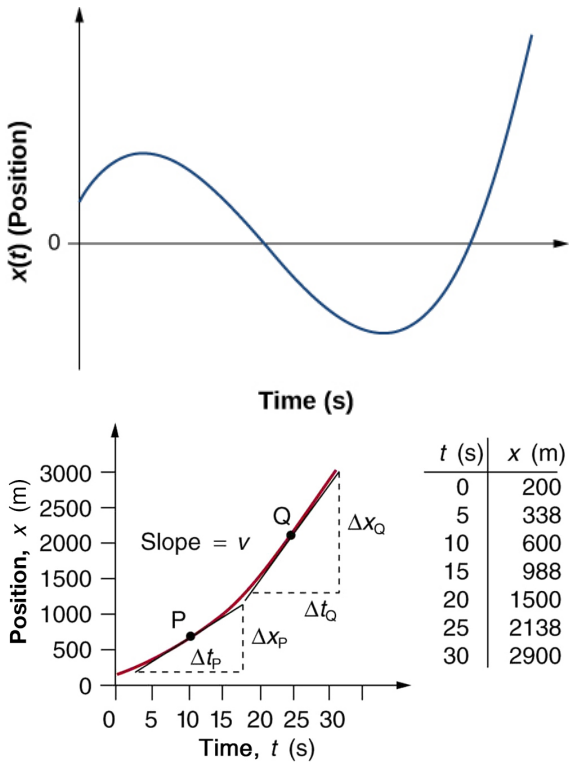

Figure 1: (Left) A system moves with constant velocity. Velocity is the slope on this plot. (Right) A system moves with non-constant velocity.

4. Consider the motion of the sytem depicted in Fig. 1 (bottom). (a) From the given data, calculate the speed of the system at points P and Q. (b) Is the acceleration of the sytem positive or negative? Estimate the acceleration.