Wednesday warm-up: Kinematics, II

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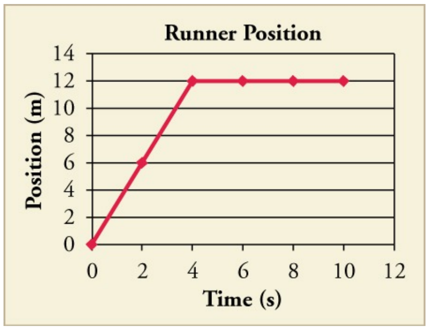

Figure 1: (Left) A system moves with constant velocity. Velocity is the slope on this plot. (Right) A system moves with non-constant velocity.

1 Memory Bank

1. $v = \frac{\Delta x}{\Delta t}$ ... Average velocity.
2. $x(t) = \frac{1}{2}at^2 + v_i t + x_i$ ... Position versus time with constant accerlation.
3. $a = \frac{\Delta v}{\Delta t}$ ... Acceleration is the change in velocity.
4. $v_f^2 = v_i^2 + 2a\Delta x$ ... Kinematic equation without time.

2 Graphical Analysis of Kinematics

1. Consider the motion of the runner depicted in Fig. 1. (a) What is the speed of the system after $t = 4$ seconds? (b) What is the acceleration between $t = 0$ and $t = 4$ seconds? (c) What is the speed of the runner between $t = 0$ and $t = 4$ seconds?

2. Now change the y-axis units in Fig. 1 to velocity, in meters per second. Answer parts (a)-(c) from the previous question again. For part (c), write your answer as a function of time.

3. Suppose a runner accelerates at 3 m s^{-2}, starting from rest. (a) *Where* does the runner reach 10 m s^{-1}? (b) *When* does the runnder reach 10 m s^{-1}?