Wednesday warm-up: Kinematics, II and III

Prof. Jordan C. Hanson

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1 Memory Bank

1. Assume that acceleration is constant: $a = 3.0$ (m/s^2), and that $\Delta x = x_f - x_i$
2. $v_f(t) = at + v_i$ (m/s)
3. $x(t) = \frac{1}{2}at^2 + v_i t + x_i$ (m)
4. $v_f^2 = v_i^2 + 2a\Delta x$ (m/s)^2.
5. $R = v_i^2 \sin(2\theta)/g$ ... Range formula for projectile motion.

2 Chapter 3 - Constant Acceleration

1. A particle moves in a straight line with an initial velocity of 30 m s^{-1} and constant acceleration 30 m s^{-2}. (a) What is its displacement at $t = 5$ s? (b) What is its velocity at this same time?

2. A swan on a lake gets airborne by flapping its wings and running on top of the water. (a) If the swan must reach a velocity of 6.00 m s^{-1} to take off and it accelerates from rest at an average rate of 0.35 m s^{-2}, how far will it travel before becoming airborne? (b) How long does this take?

3. Notice the final formula in the Memory Bank. Let R represent the *range* of a ball thrown at an angle θ with respect to the horizontal plane at an initial speed of v_i. (a) Cook up a reasonable set of numbers for a thrown baseball, and calculate the range. (b) What happens to the range if v_i is doubled? (c) What happens to the range if v_i is decreased by a factor of 2?