Warm Up: Unit 1 Kinematics and Calculus Exercise

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1 Memory Bank

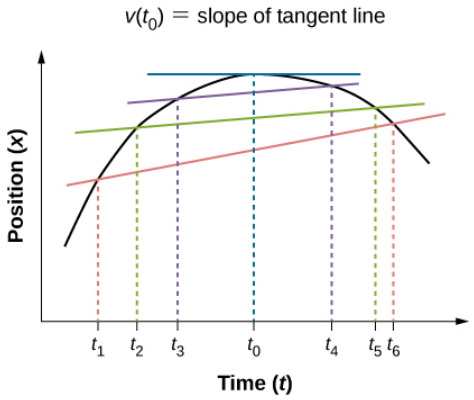
1. The derivative, or slope, of a function $f(t) = at^n + b$ is $f'(t) = ant^{n-1}$. For example, if $f(t) = \frac{1}{2}at^2$, then the derivative is $f'(t) = at$, because $n = 2$. If $f(t) = at$, then $f'(t) = a$, because $n = 1$.
2. $v(t) = at + v_i$ ... Velocity of a system at a time t is the acceleration (a) times time, plus initial velocity v_i.
3. $x(t) = \frac{1}{2}at^2 + v_i t + x_i$ ... The position of a system at time t is equal to one-half the acceleration times time squared, plus initial velocity times time, plus initial position.

2 Calculus Exercises

1. Let $f(t) = 3t + 2$. Evalute the following:
   - $f(-\frac{2}{3})$
   - $f'(t)$
   - $f'(-\frac{2}{3})$
2. Let $f(t) = \frac{3}{2}t^2 - \frac{3}{2}$. Evalute the following:
   - $f(1)$
   - $f'(t)$
   - $f'(1)$

3 Chapters 3.1 - 3.6

1. The *instantaneous velocity* is the derivative or slope of position versus time. (a) What is the instantaneous velocity



   at t_0? (b) Is the average velocity between t_1 and t_6 greater than, less than, or equal to the instantaneous velocity at t_0?
2. If $x(t) = \frac{3}{2}t^2 + 10$ meters, what is $v(t)$? What is $v(1)$? *Assume time is measured in seconds.*