8.2 Connecting Pos, Vel, Acc with Integrals

CA #2

Calculus Name: _____

1. A ball is thrown at the ground from the top of a tall building. The speed of the ball in meters per second is $v(t) = 9.8t + v_0$, where t denotes the number of seconds since the ball has been thrown and v_0 is the initial speed of the ball (also in meters per second). If the ball travels 25 meters during the first 2 seconds after it is thrown, what was the initial speed of the ball?

2. **Calculator active.** A particle's velocity is given by $v(t) = t^2 - 3t + 2$, where t is measured in hours, v is measured in miles per hour, and $s(t)$ represents the particle's position.
   a. If $s(2) = 5$, what is the value of $s(5)$?

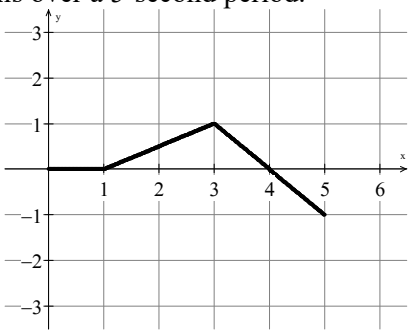
   b. What is the net change in distance over the first 5 hours?

   c. What is the total distance traveled by the particle during the first 5 miles? Show the set up of three integrals, then use a calculator.

3. **Calculator active.** A particle moves along the *x*-axis with a velocity of $v(t) = \sqrt[3]{t^2} - \frac{1}{t^2}$ measured in inches/second. At $t = 1$ the position of the particle is 3 inches. What is the particle's position at $t = 8$?

4. A particle moves along the *y*-axis with a velocity of $v(t) = \frac{1}{t} - \frac{t^2}{3} + 2$. At $t = 1$ seconds the position of the particle is 8 meters. Find the both the acceleration and position function.

5. The graph to the right shows the velocity of an object moving along the x-axis over a 5-second period.



a) If the objected started 2 meters to the left, where is the object after 3 seconds?

b) If the objected started 2 meters to the left, where is the object after 5 seconds?

c) Find the total distance traveled by the object over the 5-second period.

6. A particle moves along the x-axis for $t \geq 0$ with an acceleration of $a(t) = 24t$ where t is time in seconds. The particle's velocity at $t = 1$ is -36 cm/sec. The position of the particle at $t = 1$ is -5 cm. What is the position of the particle when the velocity is zero?

Answers to 8.2 CA #2

1. 2.7 meters per second	2a. 18.5 2b. 14.16667 miles 2c. $\left\|\int_0^1 v(t)\,dt\right\| + \left\|\int_1^2 v(t)\,dt\right\| + \left\|\int_2^5 v(t)\,dt\right\|$	3. 20.725 inches
4. Pos: $s(t) = \ln\|t\| - \frac{1}{9}t^3 + 2t + \frac{55}{9}$ Accel: $a(t) = -\frac{1}{t^2} - \frac{2}{3}t$	5a. 1 meter to the left. 5b. 1 meter to the left. 5c. 2 meters.	6. $s(t) = 4t^3 - 48t + 39$ $s(2) = -27$ cm