## Net Change: Integrating the Derivative- HW Problems

The velocity in ft/sec of a particle moving along a line is given below. Find the displacement and the distance travelled by the particle over the interval.

1. $v(t) = t^2 - 4t + 3, \quad 0 \le t \le 4$

2. $v(t) = t^2 - 2t - 8, \quad 1 \le t \le 5$

The acceleration in $m/sec^2$, initial velocity in $m/sec$, and initial position are given for a particle moving in a line. Find the velocity at time $t$, the distance travelled over the interval, and the position function at time $t$.

3. $a(t) = t - 1, \quad v(0) = 4, \quad s(0) = 2, \quad 0 \le t \le 5$

4. $a(t) = 2t - 1, \quad v(0) = -6, \quad s(0) = 1, \quad 0 \le t \le 2$

5. At time $t = 0$, a storage tank contains 1125 gallons of water. Water flows out of the tank at a rate of $r(t) = 150 - 10t$ gallons per minute, where $0 \le t \le 15$. Find the amount of water that flows out of the tank over the first 5 minutes. How much flows out when $5 \le t \le 10$? How much water is left in the tank after 10min.?

6. The population of a town today is 10,000. The population is projected to grow at a rate of $P'(t) = 100(1 + \frac{1}{\sqrt{t}})$, where $t$ is in years. What is the projected change in population over the next 10 years? What is the projected population 10 years from today?