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6.7 Rectilinear Motion Revisited; Average Value (Homework)

1. A particle moves along the x-axis so that, at any time $t \geq 0$, its acceleration is given by a(t) = 6t + 6. At time t = 0, the velocity of the particle is -9, and its position is -27.
a) Find v(t), the velocity of the particle at any time $t \geq 0$.
b) For what value(s) of $t \geq 0$ is the particle moving to the right?
c) Find x(t), the position of the particle at any time $t \geq 0$.
d) Find the average velocity from t = 0 to t = 2.
e) Find the total distance traveled from t = 0 to t = 2.
f) Find the displacement of the particle from t = 0 to t = 2.

2. A particle moves along the x-axis with acceleration given by $a(t) = \cos t$ for $t \geq 0$. At t = 0 the velocity v(t) of the particle is 2 and the position x(t) is 5.
a) Write an expression for the velocity v(t) of the particle at any time t
b) Write an expression for the position x(t) of the particle at any time t.
c) For what value(s) of t is the particle moving to the right? Justify your answer.
d) Find the total distance traveled by the particle from $t = 0$ to $t = \pi/2$.
e) Find the displacement of the particle from t = 0 to $t = \pi/2$.
f) Find the average velocity from $t = 0$ to $t = \pi/2$.
g) Find the average acceleration from $t = 0$ to $t = \pi/2$

3. A particle moves along the x-axis so that its acceleration at any given time t is given by a(t) = 6t – 18. At time t = 0, the velocity of the particle is v(0) = 24, and at time t = 1 its position is x(1) = 20.
a) Write an expression for the velocity v(t) of the particle at any time t.
b) For what value(s) of t is the particle at rest?
c) Write an expression for the position x(t) of the particle at any time t.
d) Find the total distance traveled by the particle from t = 1 to t = 3.
e) Find the average velocity from t = 1 to t = 3.
f) Find the average acceleration from t = 1 to t = 3.