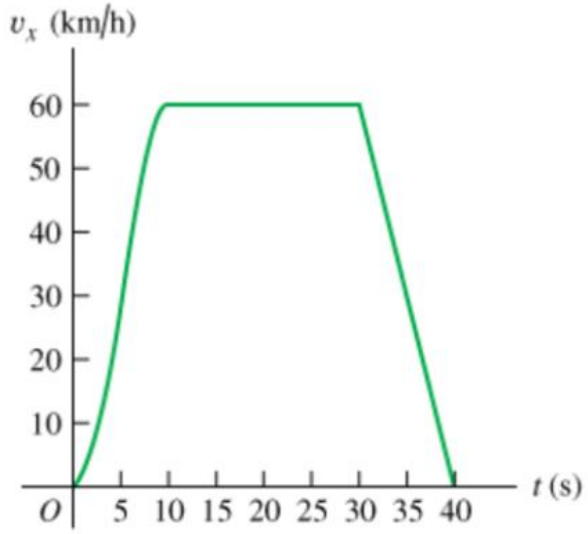
Name_____

Date_____Pd____

UNIT I: Worksheet 2



1. Refer to the velocity-time graph above.
   a. During what time interval(s) does the instantaneous acceleration have its most positive value?

   b. During what time interval(s) does the instantaneous acceleration have its most negative value?

   c. What is the instantaneous acceleration at $t = 20s$, $t = 35s$?

   d. Sketch motion maps of position, velocity, and acceleration.

2. The position of the front bumper of a test car under microprocessor control is given by $x(t) = 2.17\ m + (4.80\ m/s^2)t^2 - (0.100\ m/s^6)t^6$.
   a. What is the position of the car at the instants when the car has zero velocity?

b. What is the acceleration of the car at the instants when the car has zero velocity?

c. Sketch $x - t$, $v_x - t$, and $a_x - t$ graphs for the motion of the car from $t = 0s$ to $t = 2s$.

3. A person looking out the window of a tall office building observes what he suspects is a UFO. The person records the position of the object as a function of time and finds that it is given by $\vec{r}(t) = -(5.0\ m/s)t\hat{\imath} + (10.0\ m/s)t\hat{\jmath} + [(7.0\ m/s)t - (3.0\ m/s^2)t^2]\hat{k}$.
   a. What are the position, velocity, and acceleration vectors for the object at $t = 5.0s$?

   b. Justify if the acceleration is constant or changes with time.

4. Consider a flywheel with angular position $\theta = (2.0\ \text{rad/s}^3)t^3$. The diameter of the flywheel is 0.36 m.
   a. Calculate the instantaneous angular acceleration at $t = 3.5s$.

   b. Calculate the instantaneous angular velocity at $t = 3.5s$.

   c. Explain why your result is not equal to the average angular velocity for the 2.0 s to 5.0 s time interval, even though 3.5 s is at the middle of this time interval.