**Your Name:** _____

**PHY203**
**Exam #1**
**Chapters 1-3**
**Fri., 2/19/21**

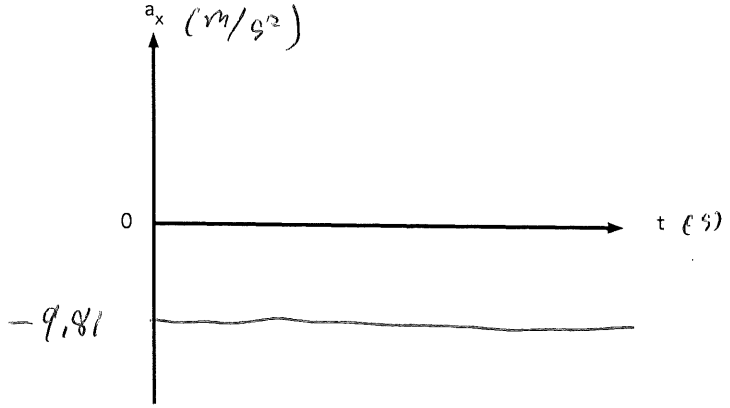
Solutions

Exam1S21

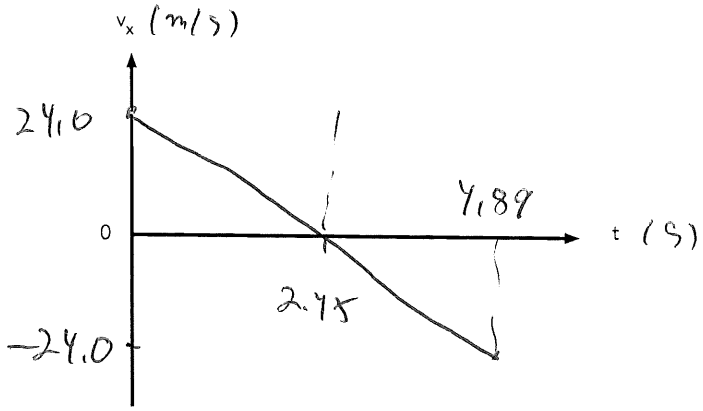
1. A ball is thrown straight up from ground level (x=0) at t=0 with an initial speed of 24.0 m/s.

Plot the following from t=0 until the ball hits the ground again, including appropriate values including units on **both** axes. Take "up" as the positive x-direction.

a. Acceleration vs. time. (**10**)



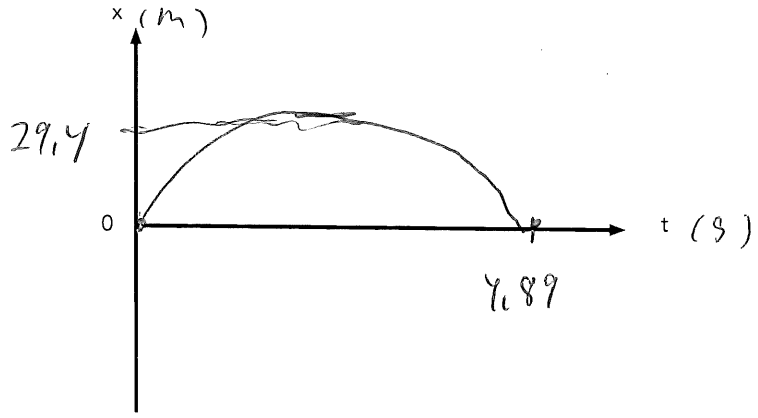

b. Velocity vs. time. (**10**)




$0 = 24.0 - 9t$

$t = 2.45$

c. Position vs. time. (**10**)




$0 = 24.0^2 - 2g\Delta x$

$\Delta x =$


2. Two trains approach each other on parallel tracks. At t = 0 the train on the left starts from rest at x = -55.0 m. At t = 2.50 s the train passes the x = 0 point. At t = 3.00 s, the train on the right passes the x = 250 m position with a constant speed of 19.0 m/s.

a. Find the (constant) acceleration of train A. (**10**)

$$x = 0 = -55.0 + 0 + \frac{1}{2} a (2.50)^2$$

$$a = 17.6 \text{ m/s}^2$$

b. Using the coordinate system depicted above, write an equation of motion (x vs. t) for the train on the left: (**15**)

$x_l =$ $-55.0 + \frac{1}{2}(17.6)t^2$

c. Using the coordinate system depicted above, write an equation of motion (x vs. t) for the train on the right: (**15**)

$x_r =$ $250 - 19.0(t - 3.00)$

d. Find the time at which the centers of the trains are side-by-side. (**5**)

$$-55.0 + \frac{1}{2}(17.6)t^2 = 250 - 19.0(t - 3.00)$$

$$-55.0 + 8.8t^2 = 250 - 19t + 57$$

$$8.8t^2 + 19t - 362 = 0$$

$$t = \frac{-19 \pm \sqrt{19^2 + 4 \cdot 8.8 \cdot 362}}{2 \cdot 8.8}$$

$$t = 5.423$$

3. While trying out for the position of pitcher on your high school baseball team, you throw a fastball at 37.0 m/s toward home plate, which is 18.4 m away. How far does the ball drop due to effects of gravity by the time it reaches home plate? (Ignore any effects due to air resistance and assume you throw the ball horizontally.) (**25**)


$x$: $18.4 = 37.0\,t$

$t = 0.497\ s$

$y$: $y_f = 0 + 0 - \frac{1}{2} g (.497)^2$

$y_f = 1.21\ m$

Drop = **1.21 m**