

Name: _____

PHYS 1110-02 Quiz 1

You may use an 8.5"×11" note sheet written on both sides, a calculator of any type, and a rock. You have 50 minutes.

Please write your answers in the boxes provided. Show your work outside the boxes.

Constants and equivalents

$$g = 9.8 \text{ m/s}^2$$

$$1 \text{ h} = 60 \text{ min}$$

$$1 \text{ min} = 60 \text{ s}$$

$$1 \text{ day} = 24 \text{ h}$$

$$1 \text{ in} = 2.54 \text{ cm}$$

$$1 \text{ ft} = 12 \text{ in}$$

$$1 \text{ m} = 3.281 \text{ ft}$$

$$1 \text{ mi} = 5280 \text{ ft} = 1609.3 \text{ m}$$

Some metric prefixes

$$\text{nano } n \times 10^{-9}$$

$$\text{deka } D \times 10^1$$

$$\text{micro } \mu \times 10^{-6}$$

$$\text{hecta } h \times 10^2$$

$$\text{milli } m \times 10^{-3}$$

$$\text{kilo } k \times 10^3$$

$$\text{centi } c \times 10^{-2}$$

$$\text{mega } M \times 10^6$$

$$\text{deci } d \times 10^{-1}$$

$$\text{giga } G \times 10^9$$

Questions

1. A formula that you haven't learned yet is $K = \frac{1}{2}mv^2$. In this formula, m is a mass and v is a speed. What are the SI units of K ?

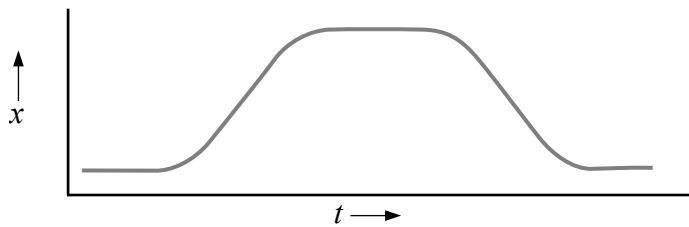
2. Another formula we'll see eventually is $F = G \frac{m_1 m_2}{r^2}$, where m_1 and m_2 are masses, r is a distance, and the SI units of F are $\text{kg} \cdot \text{m/s}^2$. What are the SI units of G ?

3. Still another formula we'll eventually see is $U = \frac{1}{2}kx^2$, where the SI unit of U is $\text{kg} \cdot \text{m}^2/\text{s}^2$ and the SI unit of k is kg/s^2 . What are the SI units of x ?

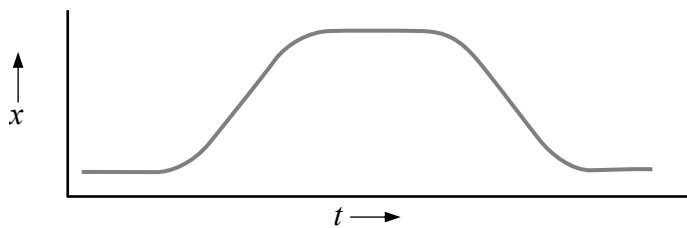
4. The acceleration due to gravity at the surface of the Earth is 9.8 m/s^2 , conventionally assigned the symbol g . This creates a convenient unit of acceleration, the g , where one g is an acceleration of 9.8 m/s^2 . The greatest acceleration a human body can survive for a brief period is about 250 m/s^2 . How many g 's is 250 m/s^2 ?

5. Large volumes of water, such as are stored in reservoirs, are measured in the USA in acre·feet. One acre·foot is the volume that inundates an area of one acre to a depth of one foot. An acre is the area of a rectangle that is $1/8$ of a mile long and $1/80$ of a mile wide. How many cubic meters are in one acre·foot?

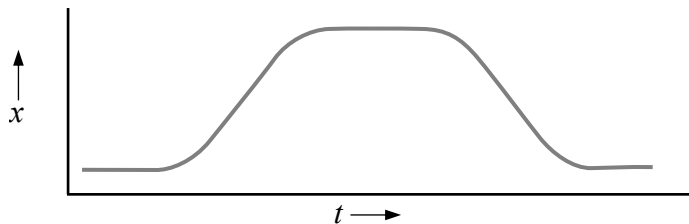
6. Several copies of a position-time graph for some object's motion are shown below.
- Mark on the plot when the object's velocity is positive.



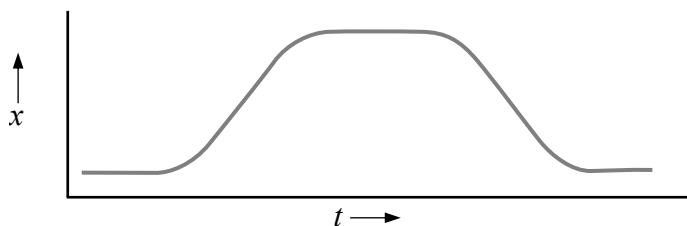
- Mark on the plot when the object's velocity is zero.



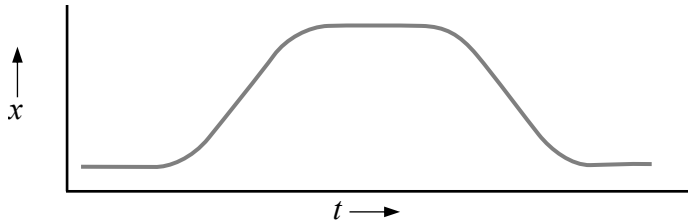
- Mark on the plot where the object's velocity is negative.



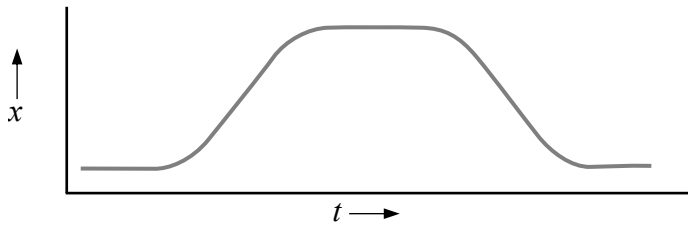
- Mark on the plot where the object's acceleration is positive.



- e. Mark on the plot where the object's acceleration is zero.



- f. Mark on the plot where the object's acceleration is negative.



7. A bicycle race course consists of a 1600-meter loop that the racers repeat for a set time. A racer completes one loop in 145 seconds.

- a. What is the path length of one circuit around the loop?

- b. What is displacement of one circuit around the loop?

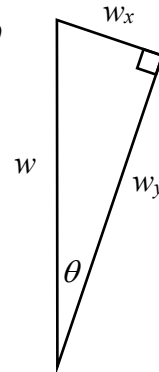
- c. What is the cyclist's average speed around the loop once?

- d. What is the cyclist's average velocity around the loop once?

8. Starting from rest, a bullet constantly accelerates down a rifle barrel, traveling 0.58 m to reach a speed of 400 m/s. How much time does it take?

9. Tybalt and Mercutio notice each other across the Verona town square, when they are 75 meters apart. They run toward each other, Tybalt at a speed of 4.5 meters per second and Mercutio at a speed of 3.0 meters per second, until they are 2.5 meters apart. Then, they stop and shout insults at each other. How much time does it take for them to reach a distance of 2.5 meters from each other?

10. The right triangle illustrated to the right is labeled with an interior angle θ and the lengths of its three sides. Identify the ratios corresponding to the specified trigonometric functions of θ by filling the circles to the left of the correct choices.



- a. $\sin \theta =$
☐ w/w_x ☐ w/w_y ☐ w_x/w ☐ w_x/w_y ☐ w_y/w ☐ w_y/w_x
- b. $\cos \theta =$
☐ w/w_x ☐ w/w_y ☐ w_x/w ☐ w_x/w_y ☐ w_y/w ☐ w_y/w_x
- c. $\tan \theta =$
☐ w/w_x ☐ w/w_y ☐ w_x/w ☐ w_x/w_y ☐ w_y/w ☐ w_y/w_x

11. For the right triangle illustrated in question 7, Express the length of side w_x in terms of the lengths of sides w and w_y .

12. Vector $\vec{v}$ has a magnitude of 7.00 m/s at an angle of 35° counterclockwise of the $+x$ axis.

- a. Tell me v_x , the x -component of $\vec{v}$.

- b. Tell me v_y , the y -component of $\vec{v}$.

13. Vector $\vec{A}$ has components $(15.0 \text{ m}, -20.0 \text{ m})$, and vector $\vec{B}$ has components $(-48.0 \text{ m}, -36.0 \text{ m})$.

a. What is the magnitude of vector $\vec{A} + \vec{B}$?

b. What is the direction of $\vec{A} + \vec{B}$, in degrees counterclockwise of the $+x$ axis?