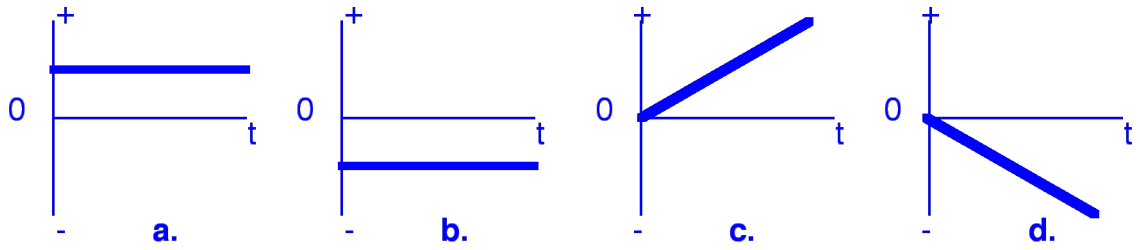
Your Name: _____

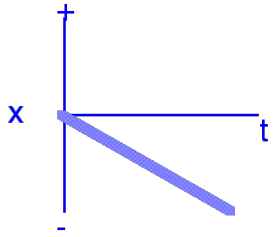
PHY203
Final Exam
Part 1
Chapters 1-3
Dec. 14, 2010

Solutions



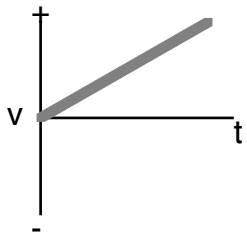
Given the choices above, answer the following questions, 1-5:

1. Given a plot of x vs. t as shown below, which of the graphs above depicts a plot of velocity vs. t: a., **b**., c., d., or e. none of the above?

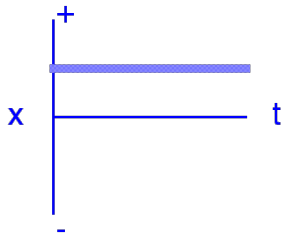


2. Given the same plot of x vs. t as shown in #1, which of the graphs above depicts a plot of acceleration vs. t: a., b., c., d., or **e**. none of the above?

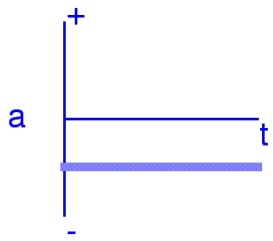
3. Given a plot of velocity vs. t as shown below, which of the graphs above depicts a plot of acceleration vs. t: **a**., b., c., d., or e. none of the above?



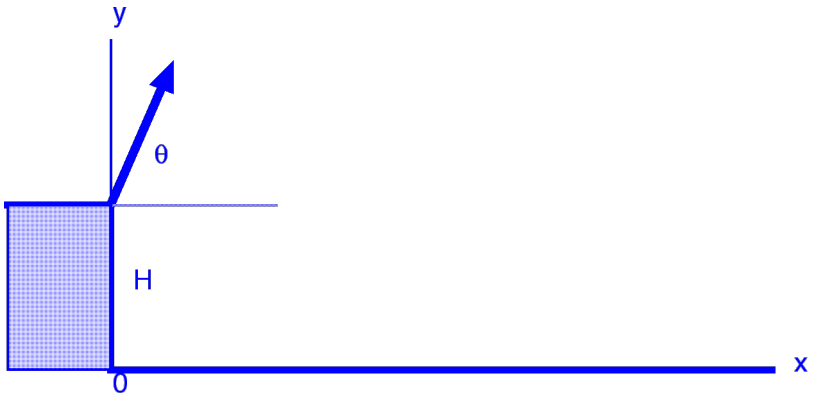
4. Given a plot of x vs. t as shown below, which of the graphs above depicts a plot of velocity vs. t: a., b., c., d., or **e**. none of the above?



5. Given a plot of acceleration vs. t as shown below, which of the graphs above depicts a plot of velocity vs. t: a., b., c., **d**., or e. none of the above?



For problems 6-10, on Planet XXX, the acceleration due to gravity is exactly 10 m/s^2. A missile is shot from a cliff with height H = 400 m and initial speed of 40 m/s and an angle $\theta = 55^o$,as shown below.



6. Find the x and y components of the initial velocity vector.

a. v_{x0} = 22.9 m/s; v_{y0} = 10 m/s $v_{x0} = 40 \cos 55^o$

b. v_{x0} = 22.9 m/s; v_{y0} = 32.8 m/s $v_{y0} = 40 \sin 55^o$

c. v_{x0} = 32.8 m/s; v_{y0} = 10 m/s

d. v_{x0} = 32.8 m/s; v_{y0} = 22.9 m/s

e. None of the above

7. Calculate the time that it will take for the missile to reach its highest point.

a. 1.0 s $0 = (32.8 \text{ m/s}) - (10 \text{ m/s}^2)(t)$

b. 2.3 s

c. 3.3 s

d. 10.0 s

e. None of the above

8. Calculate the y distance above the cliff at which the missile reaches its highest point.

a. 1.6 m $0 = (32.8 \text{m/s})^2 - 2(10 \text{ m/s}^2)(\Delta y)$

b. 5.0 m

c. 26.4 m

d. 54 m

e. None of the above

9. Calculate the time from launch that it will take for the missile to hit the ground.

a. 11.5 s $0 = 400m + 32.8\ m/s\ t + 1/2(-10\ m/s^2)t^2$

b. 16.4 s solve quadratic eq.

c. 12.8 s

d. 18.3 s

e. None of the above

10. Calculate the x position at which the missile will hit the ground.

a. 265 m $x = (23.0\ m/s)(12.8s)$

b. 293 m

c. 377 m

d. 420 m

e. None of the above

For problems 11 and 12 consider two trains traveling in opposite directions on parallel tracks. The measurements start when the fronts of the trains are 500 m apart. In all cases below, train 1 is traveling to the right and passes the position x = 0 at t = 0 traveling in the positive x-direction at a constant speed of 5 m/s. In both cases below, find the x position at which the front of train 2 is side-by-side with the front of train 1.

11. Case 1: Train 2 passes the x= 500 m position at t = 0 traveling with a constant speed of 3 m/s.

a. 187.5 m $x_1 = 5t\ ;\ x_2 = 500-3t$

b. 250 m $x_1 = x_2$:$5t = -3t + 500;\ 8t=-500;\ t = 62.5\ s$

c. 312.5 m $x_1 = 5(62.5)$

d. 1250 m

e. None of the above

12. Case 2: Train 2 starts from rest at the x= 500m position at t=5 s traveling with a constant magnitude of acceleration of 4 m/s^2.

a. 50 m $x_1 = 5t\ ;\ x_2 = 500-1/2(4(t-5)^2)$

b. 58.6 m $x_1 = x_2\ t = 19.2\ s$

c. 96 m $x_1 = 5(19.2)$

d. 225 m

e. None of the above

13. Let **A** = -3**i** + 8**j**, **B** = -4**i** - 6**j**, **C** = 2**A** – 3**B**

a. Sketch the vectors A and B on the plot below.

Show your work below.

b. Find the magnitude of the vector **A** and the angle that vector **A** makes with the positive x-axis (measured from the positive x-axis in a counterclockwise direction).

$A = (3^2 + 8^2)^{1/2} = 8.54$

$\theta = 90 + \tan^{-1}(3/8) = 110.6^o$

c. Find the magnitude of the vector **B** and the angle that vector **B** makes with the positive x-axis (measured from the positive x-axis in a counterclockwise direction).

$B = (4^2 + 6^2)^{1/2} = 7.21$

$\theta = 180 + \tan^{-1}(6/4) = 236.3^o$

d. Write vector **C** in vector notation.

C = 2(-3**i** + 8**j**) - 3(-4**i** - 6**j**) = 6**i** + 34**j**

e. Find the magnitude of the vector **C** and the angle that vector **C** makes with the positive x-axis (measured from the positive x-axis in a counterclockwise direction).

$C = (6^2 + 34^2)^{1/2} = 34.5$

$\theta = \tan^{-1}(34/6) = 80^o$