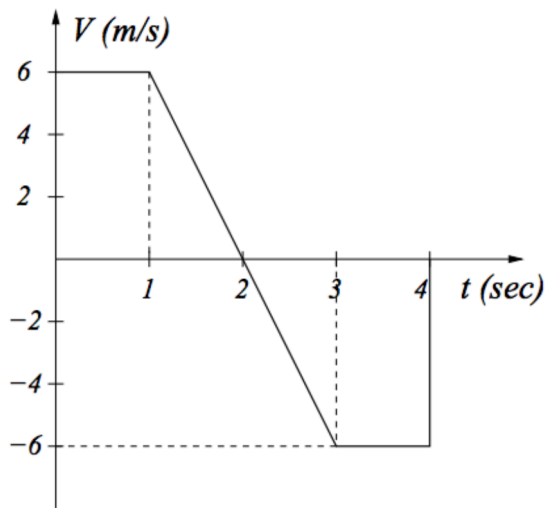


Engineering Physics I Fall 2015
Practice Midterm 1
Name:

You have 1 hour and 15 minutes to complete this exam. Read all questions carefully and show your work as much as possible for partial credit. Be careful with your units! For this practice exam, no formula sheet will be given.

Problem 1 (15 points)

A particle moves in a straight line in the x direction. At time $t = 0$, $x = 0$. The velocity v of the particle changes with time as shown in the figure.



- a) draw $x(t)$ for times 0 to 4 seconds
- b) what is x (in meters) at time $t=1$ s?
- c) what is the acceleration (m/s^2) at time $t = 2$ s?
- d) what is x (in meters) at time $t=4$ s?
- e) what is the average speed between $t = 0$ and $t = 3$ seconds?

Problem 2 (5 points)

Convert an acceleration of 10 m/s^2 to m/min^2

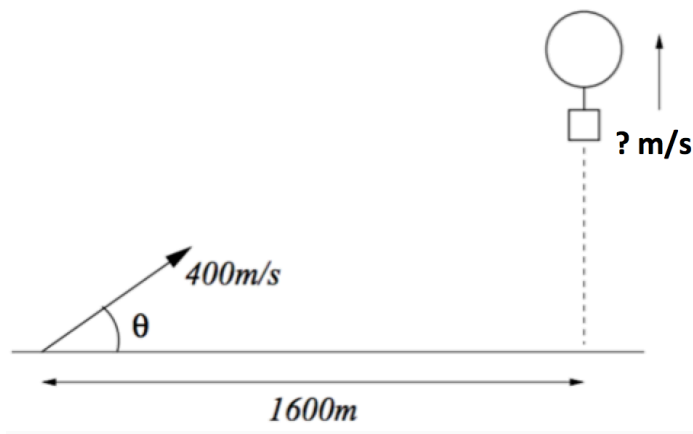
Problem 3 (10 points)

Vector **A** = $2 \mathbf{x} + 3 \mathbf{y}$

Vector **B** = $-2 \mathbf{x} + 1 \mathbf{y}$

What is the angle between these two vectors?

Problem 4 (30 points)



A balloon is launched at time $t=0$ at a height of 800 m and moves upward at a constant velocity (i.e., ignore the effect of gravity on the balloon). The balloon is a horizontal distance of 1600 meters away from you. At time $t = 0$, you shoot an arrow with an initial velocity of 400 m/s at a fixed angle α , where $\sin \alpha = 3/5$ and $\cos \alpha = 4/5$. Assume $g = 10\text{ m/s}^2$.

- a) How long does it take the arrow to reach the balloon?
- b) At what height will the arrow hit the balloon?
- c) What is the balloon's upward velocity?

Problem 5 (40 points)

A moving walkway at an airport is 35 meters long and moves at a velocity of 1 m/s in the positive x direction.

- a) If a woman steps on the start of the walkway at time $t = 0$ s and walks with a velocity $\mathbf{v} = 1.5 \text{ m/s } \hat{x}$ relative to the moving walkway, how much time does it take her (in seconds) to reach the end of the walkway?
- b) What is her velocity with respect to the ground?
- c) Another woman steps on the walkway, also walking with a velocity $\mathbf{v} = 1.5 \text{ m/s } \hat{x}$ relative to the moving walkway. Halfway down the walkway, the woman throws a ball vertically up in the air with an initial velocity of 2 m/s. She catches it at the same height at which she threw it. How far has the ball moved in the x direction with respect to the moving walkway? With respect to the ground?