# PY105 Assignment 1 (933653)

0/20

Fri Sep 18 2009 10:15 PM EDT

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Points | 0/2 | 0/2 | 0/2 | 0/1 | 0/1 | 0/5 | 0/2 | 0/1 | 0/2 | 0/2 |

**Total**
**0/20**

**Description**

This assignment is worth 20 points. Each part is worth 1 point.

**Assume the numbers given in each problem are accurate to three significant figures.** WebAssign expects your answers to be accurate within 1%. If you don't round off until the end, and then round off to three significant figures, you should be fine.

Occasionally there are errors in WebAssign. If you are convinced your answer is correct and WebAssign is grading you incorrectly please check with Professor Duffy.

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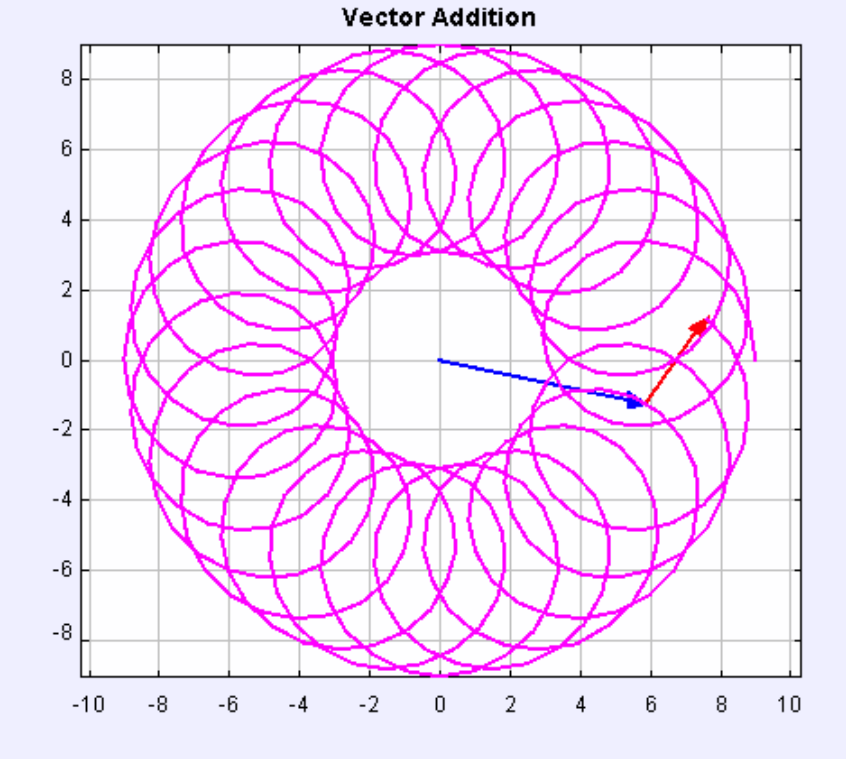
**1. 0/2 pointsDuffy_EP_Ch01_P101 [1181944]**




The animation above shows the interesting pattern generated via the addition of two rotating vectors. In the animation, the

longer vector has a constant length of 6 units, while the shorter vector has a constant length of 3 units. The pattern is then confined to the space bounded by two circles - the inner circle has a radius of 3 units, and the outer circle has a radius of 9 units.

Let's say we were to re-draw the pattern, but this time the longer vector has a length of 10 units, and the shorter vector has a length of 6 units. In this case,

(a) what is the radius of the inner circle?
4 units.

(b) what is the radius of the outer circle?
16 units.

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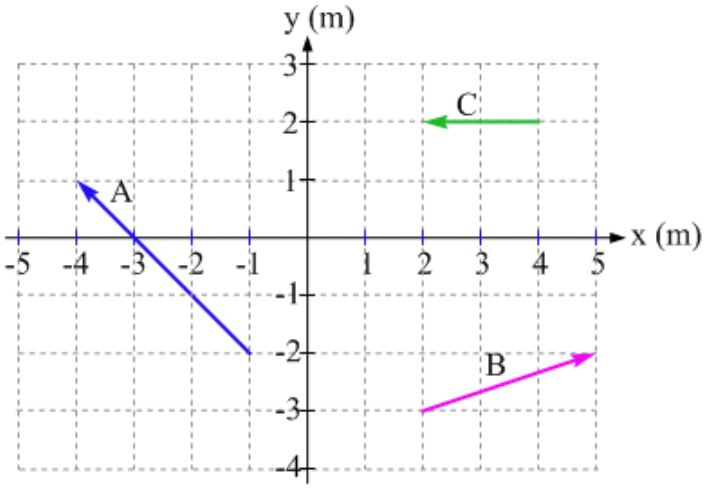
**2. 0/2 pointsDuffy_EP_Ch01_P26_alt [1181937]**

Three vectors are shown in the figure below, along with an x-y coordinate system.




Define the vector **R** to be the vector sum of the three vectors **A**, **C**, and the negative of vector **B**.
In equation form, **R** = **A** - **B** + **C**.

(a) Find the magnitude of the vector **R**:
8.25 m.

(b) Find the direction of the vector **R**. Specify the direction as an angle measured counterclockwise from the positive x-axis.
166 degrees.

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**3. 0/2 pointsDuffy_EP_Ch01_P35 [1181957]**

In the sport of orienteering, participants must plan carefully to get from one checkpoint to another in the shortest possible time. In one case, starting at a particular checkpoint, Sam decides to take a straight path that goes west for 750 meters, and then go northeast for 600 meters on another straight path to reach the next checkpoint. Northeast, by the way, means 45 degrees to both north and east.

Between the same two checkpoints, Mary decides to take the shortest distance between the two checkpoints, traveling off the paths through the woods instead.

(a) What is the distance that Mary travels between the checkpoints? (Note that Sam travels a total distance of 1350 m, although his speed is probably significantly higher than Mary's.)

535 m.

(b) In what direction does Mary go? Specify her direction as a positive angle, measured from east.

128 degrees.

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**4.** 0/1 points **Duffy_EP_Ch02_P18 [479907]**

Consider the motion diagram below, showing the position of an object at regular time intervals as it moves in one dimension. Assume that the object's acceleration is constant throughout the time interval covered by the motion diagram and that it does not reverse direction during the motion.

Select all the correct statements from the list below. Note that you must select every correct statement, and no incorrect statements, to get credit for the question.

- ☐ The object is definitely moving to the left.
- ☐ The object is definitely moving to the right.
- ☐ The object's acceleration is definitely directed to the left.
- ☐ The object's acceleration is definitely directed to the right.
- ☐ A real-life situation this motion diagram could correspond to is a car moving at constant velocity to the right.
- ☐ A real-life situation this motion diagram could correspond to is a sprinter traveling to the left but slowing down and coming to a stop at the end of a race.
- ☐ A real-life situation this motion diagram could correspond to is an overhead view of a toy car being released from rest and rolling to the right down an incline.

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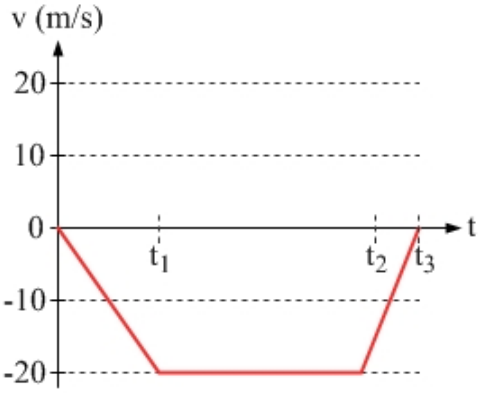
**5.** 0/1 points **Duffy_EP_Ch02_P101 [1182186]**

At $t$ = 0, a stuntwoman jumps off the top of a tall building. She is wearing a special suit, which increases the air resistance she experiences so that, after falling with constant acceleration for a time of $t_1$ = 4.00 s, she then falls with a constant velocity of 20 m/s directed down. At a time of $t_2$ = 18.0 s after leaving the top of the building, the stuntwoman reaches a safety net, which provides a constant upward acceleration that brings the stuntwoman to rest at a time of $t_3$ = 20.0 s after leaving the top of the building. The graph below shows the vertical component of the stuntwoman's velocity throughout the entire process. See if you can use the graph to help you solve the problem.




Assuming the stuntwoman comes to rest at ground level (this was a very carefully planned stunt!), how tall is the building? For reference, the John Hancock Tower in Boston, the tallest building in New England, is 241 m tall.

340 m

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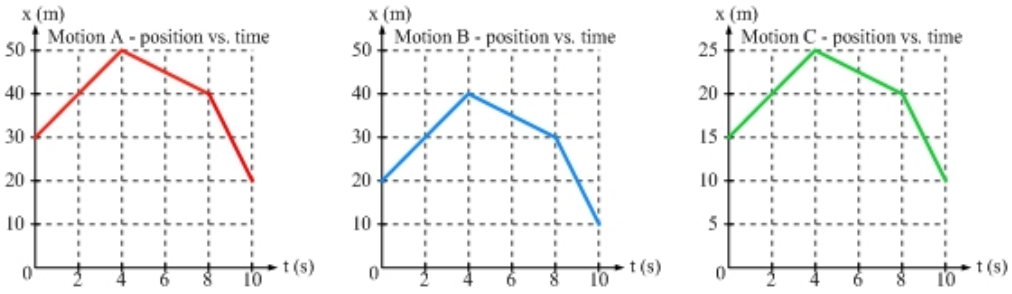
**6.** [0/5 points](#)**Duffy_EP_Ch02_P102 [1182187]**




The position vs. time graphs for three objects experiencing one-dimensional motion are shown above. Note that the scale on the vertical axis for motion C is different from the scale on the vertical axes for motions A and B.

(a) Rank these situations based on the speed of the objects at *t* = 5 s, from largest to smallest. Use only > and/or = signs in your answer (e.g., B>A=C).

A=B>C -or- B=A>C

(b) Calculate the speed of the object, at *t* = 1 s, for motion A.

5 m/s

(c) Over the entire 10-second period, determine the total distance traveled by the object for motion A.

50 m

(d) For the entire 10-second period, determine the average speed of the object for motion C.

5 m/s

(e) For the entire 10-second period, determine the average velocity of the object for motion B. Note: use a plus or minus sign, as appropriate.

-1 m/s

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**7.** [0/2 points](#)**Duffy_EP_Ch02_P52 [1181024]**

On August 16, 1960, Joe Kittinger of the United States Air Force jumped from a helium balloon from a height of 102,800 feet. After being in free fall for 4 minutes and 36 seconds, and falling for 85,300 feet, he opened his parachute and eventually landed safely on the ground. To analyze this situation, we will assume that Kittinger's initial velocity was zero, and that his acceleration was constant throughout the free fall. (This was most certainly not the case, but it gives us some idea about the motion.) Note the units we're looking for in the questions below.

(a) What was the magnitude of the acceleration during the free fall?

0.683 $m/s^2$

(b) At the end of the free fall part of the motion, what was Kittinger's speed?

188 m/s

By the way, YouTube has some videos of Kittinger's adventure. If you're interested, search for "Kittinger jump" on YouTube.

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**8.** 0/1 points **Duffy_EP_Ch02_P05 [479910]**

You are competing in a duathlon, an event that involves running and cycling. This duathlon involves running once around a particular loop, cycling twice around the same loop, and then finishing the race by again running once around the loop. If your average speed when running is 4.00 m/s and your average speed when cycling is 6.00 m/s, what was your average speed for the race? 4.8 m/s

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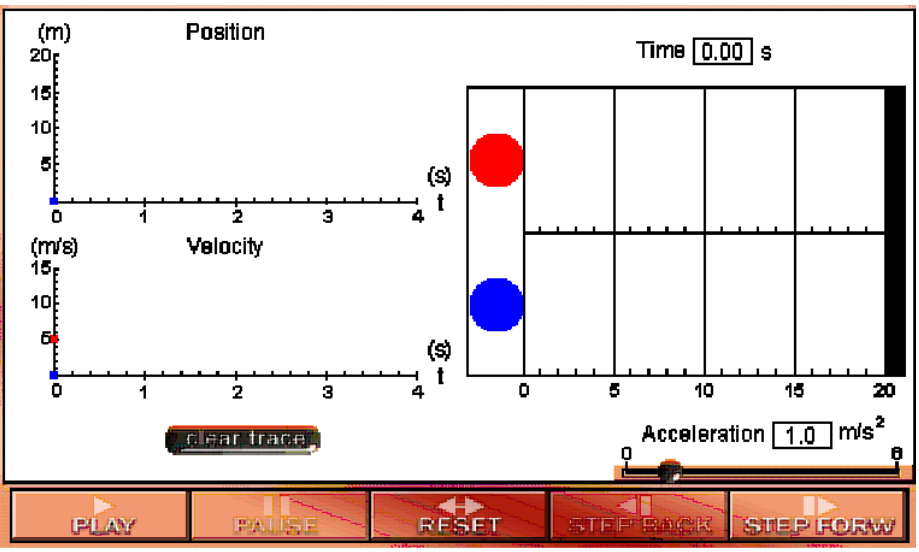
**9.** 0/2 points **Wiley Simulation 3.3. [193662]**

**Constant velocity versus constant acceleration**




Two balls have a race over a distance of 20.0 meters. The red ball travels at a constant velocity while the blue ball starts at rest and has a constant acceleration. For this problem set the blue ball's acceleration to be 3.30 $m/s^2$. Note that the simulation may stop slightly after one of the balls reaches the finish line rather than at the instant it reaches the line. Thus, you should calculate all times yourself, rather than relying on the time from the simulation, which is only accurate to plus or minus 0.05 seconds.

(a) How far is the second ball from the finish line at the instant the first ball reaches the line?

2.59 m

(b) Assume the motion continues for both balls until the second ball reaches the finish line. What is the distance between the two balls at that time?

6.4 m

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**10.** **0/2 points** **Duffy_EP_Ch02_P45 [1007884]**

You give a toy car an initial velocity of 1.50 m/s directed up a ramp. The car takes a total of 6.00 s to roll up the ramp and then roll back down again into your hand. Assume that you catch the car at the same point from which you released it, and that the acceleration is constant through the entire motion.

(a) Determine the magnitude of the car's acceleration.

0.5 $m/s^2$

(b) Determine the total distance traveled by the car in this 6.00 second period.

4.5 m

Assignment Details

Name (AID): **PY105 Assignment 1 (933653)**

Submissions Allowed: **6**

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Code: **py105_fall2009_a1**

Locked: **Yes**

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