Physics 113

Exam #1

Your name: _____

Do not turn the page until you are told to begin. Show all your work on the exam itself; no credit will be given for anything written on other paper.

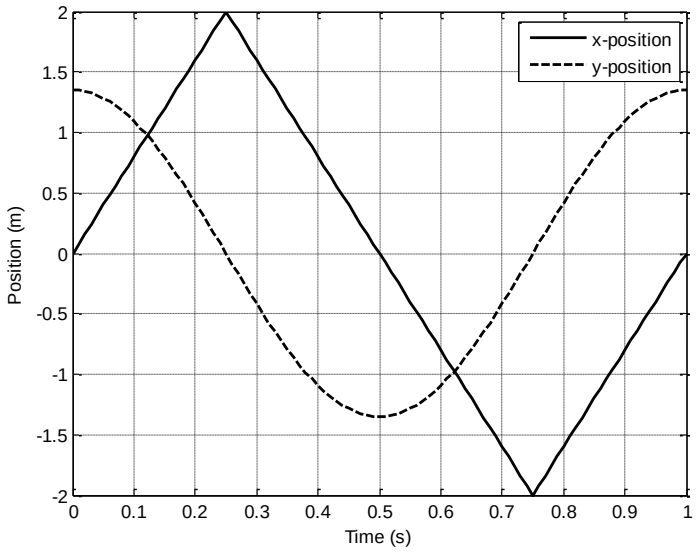
You may not use a calculator.

Do not write in the following table; it will be used for grading.

Problem 1	___ / 20
Problem 2	___ / 10
Problem 3	___ / 20
Problem 4	___ / 25
Problem 5	___ / 25
Total	___ / 100

Problem 1: Graphing [20 pts]

The components of the displacement vector for a particle as a function of time are given in the graph below:

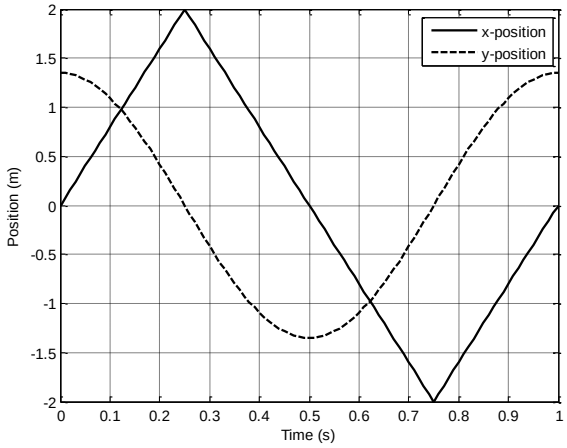


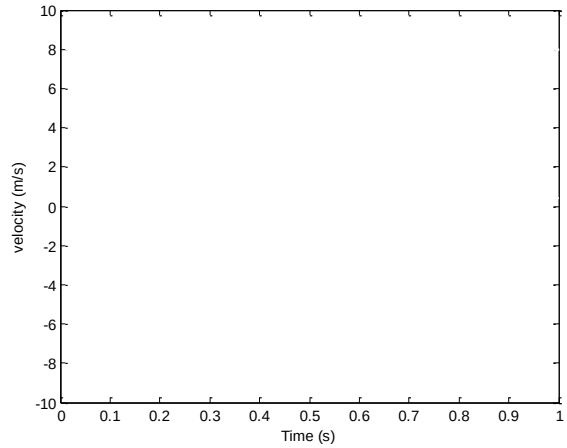
a) [8 pts] For the displacement vector fill in the following table: (do your best without a calculator. Don't stress if you leave it in an equation, $\sin\vartheta = \sqrt{\pi}$)

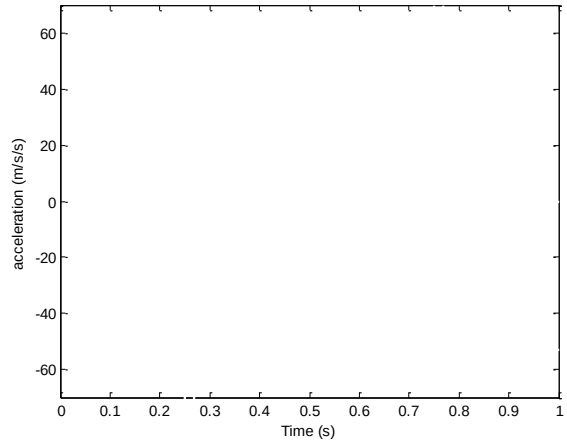
Time	Vector in Component form: $\vec{r} = r_x\hat{\imath} + r_y\hat{\jmath}$	Magnitude	Angle
$t = 0.0s$			
$t = 0.25s$			
$t = 0.5s$			
$t = 0.62s$			

Problem 1: Con't

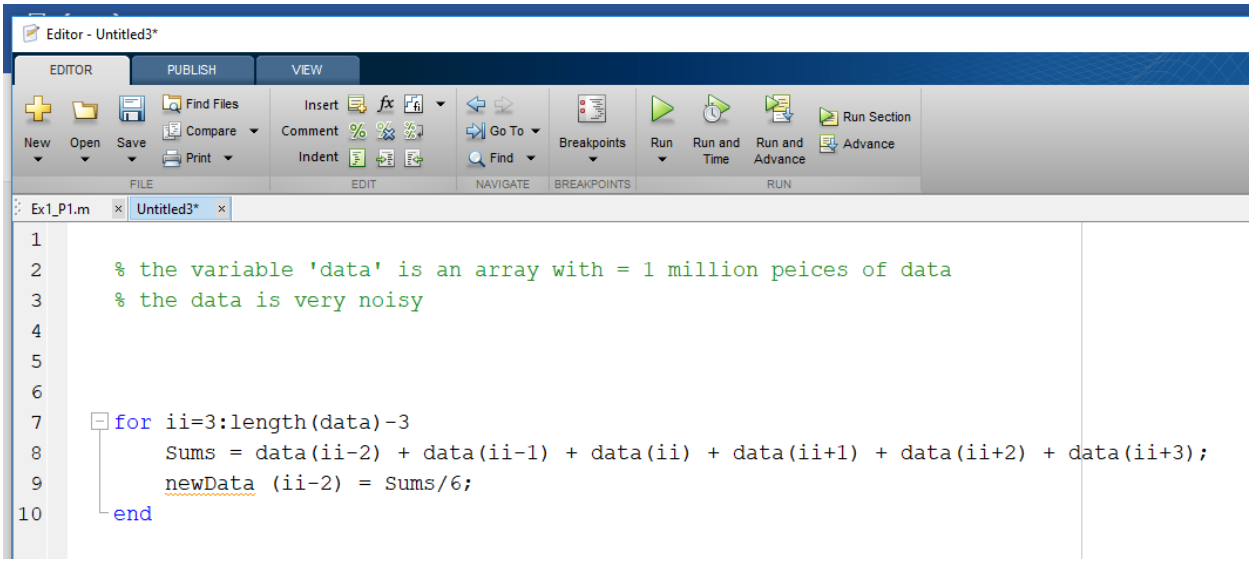
b) [12 pts] In as much details as possible, plot the components of the velocity and acceleration as a function of time.







Problem 2: Too much Noise! [10 pts] consider the following code block. What does it do? Why does it do it? What is the length of NewData at the end?



Problem 2: Con't

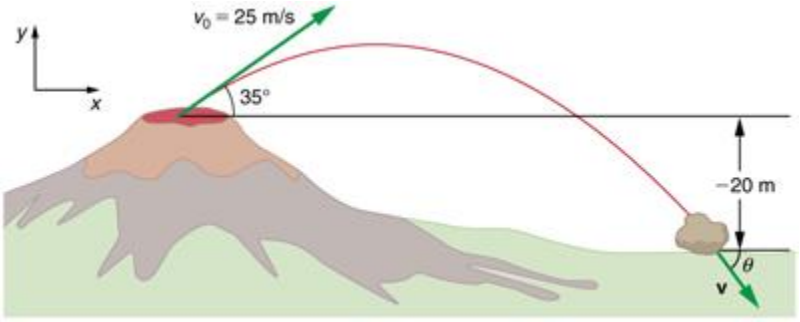
Problem 3: WIDGET [20 pts] ONE DIMENTIONAL PROBLEM ONLY You have a widget, that controls the acceleration of a toy mouse. You would like it to run down the hall for 0.5 meters in 1s and come back to you in 3s (total time). There are two knobs α and β. What should those values be if

$$a = \alpha + \beta t$$

Note the toy mouse starts at rest (hint it starts at the origin)

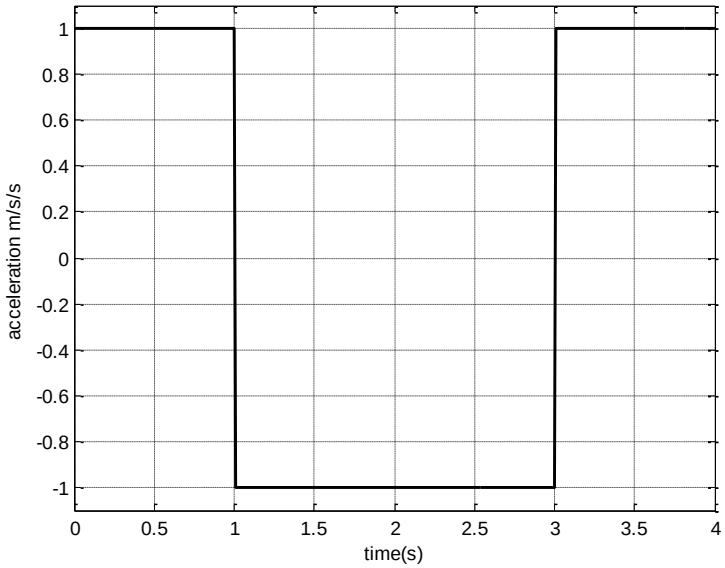
Problem 3: Con't

Problem 4: Hot Potato? [25 pts] Kilauea in Hawaii is the world's most continuously active volcano. Very active volcanoes characteristically eject red-hot rocks and lava rather than smoke and ash. Suppose a large rock is ejected from the volcano with a speed of 25.0 m/s and at an angle 35.0º above the horizontal, as shown below. The rock strikes the side of the volcano at an altitude 20.0 m lower than its starting point. (a) Calculate the time it takes the rock to follow this path. (b) What are the magnitude and direction of the rock's velocity at impact?



Problem 4: Con't

Problem 5: Starting at Rest? I am about to be Ending at rest! Good Night! [25 pts] Starting at rest, plot the velocity and position as a function of time. Include as many details as possible.



Problem 5: Con't