# 0304-342-01: Problem Solving with Computers, Spring 2012 (2011-3)

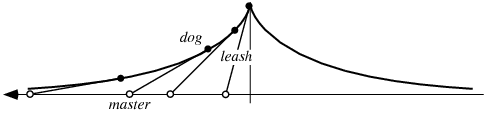
**Exam #3 – Matlab**  
Individual Work, Closed Book & Files, 55 minutes

**Instructions:** *Read carefully!*

* *Complete all of the following problems in a single Matlab script file, using individual “cells” for each problem, as we have been doing for in-class exercises. There is an electronic copy of this exam sheet on myCourses for your convenience.*
* *You must complete the exam using the lab PCs – do not use your own computer.*
* *You may use your single-sided 8½”x11” syntax notes sheet during the exam. You may also use the built-in Help system in Matlab, but no other files, webpages, or other written or electronic aids.*
* *Save your work often during the exam period!*
* *When you are done, upload your Matlab script (.m) file to the* ***Exam #3 (Matlab)*** *Dropbox on myCourses. The file should be named as follows:* Yourname\_PSWC01\_Exam3.m*. Upload any figures you are directed to save by the problems as well.*
* *The Dropbox will remain open for 5 minutes beyond the announced end of the exam period for you to save your file and complete the Dropbox submission. Failure to complete the submission by the Dropbox deadline will result in a significant score penalty.*
* *Read, sign, and date the honor pledge at the bottom of the reverse side of this exam sheet.*
* *Be sure to put your name on this exam paper, answer the indicated questions in the provided spaces, and staple your syntax notes sheet to the back of the sheet. Turn the exam sheet with your notes sheet in to the instructor before you leave. You are not required to edit the electronic copy of this exam nor upload it to the Dropbox.*
* *VERIFY that your submission to the Dropbox was successful before the deadline!*

**Problem #1:** *(10 pts)*

The “dog curve” is the path taken by a dog which begins a distance, *a*, away from his owner. The owner then walks at a unit speed in a direction perpendicular to the leash. The leash, at any given time, will be tangent to the dog’s path. Also known as the “tractrix”, the German mathematician Leibnitz found that this curve can be described parametrically as given:



*dog*

*leash*

*owner*

Write a Matlab script to:

1. Create arrays containing the *x*- & *y*- coordinates of the “tractrix” curve for 0 ≤ *t* ≤ *tmax*. Use *a* = 2 and *tmax* = 8 for the parameters of the curve.
2. Plot the “tractrix” curve. Save your plot as a “.jpg” image, named “YourName\_Exam3\_Fig1.jpg”. Make sure your plot is presentable, with all required elements. *Be sure to upload your saved figure image to the Dropbox along with your script file!*

**Problem #2:** *(10 pts)*

*d*

*d*

*2d*

*z*

A storage silo at a factory holds plastic pellets for an injection molding process. The silo’s diameter is *d*. The bottom of the silo is a cone whose height is also *d*. The cylindrical part of the silo, above the conical base, has a height of 2*d* (see figure). The silo contains a sensor which tells the operator the depth of the pellets within the silo, *z*.

Write a Matlab script to calculate the volume of pellets contained in the silo as a function of the depth, *z*. The volume of a cone and cylinder are given below the figure.

1. The script should evaluate the volume, *V*, of pellets for the entire range 0 ≤ *z* ≤ 3*d*. The script should ask the user for the value of *d* for how many evenly-spaced points within that range to evaluate.
2. The script should output a neat table of the values of *z* and *V* to the command window.

Use *d* = 1.5 m and evaluate the volume at 10 *z* points.

**Honor Pledge:**

*Since the multiple sections of this course do not take the exam at a common time, please sign and date the honor pledge below and check the appropriate box below. The university and the Kate Gleason College of Engineering take academic honesty very seriously.*

I will not discuss the contents of this exam with anyone until after all students have completed this exam. I will not share any written or electronic materials related to this exam with anyone.

**Sign & Date:**

🞏 My syntax notes sheet is attached.   
🞏 I will attach my syntax sheet to the optional final exam.  
🞏 I did not prepare or use a syntax notes sheet.