

# Math 230 — Hour Exam 1

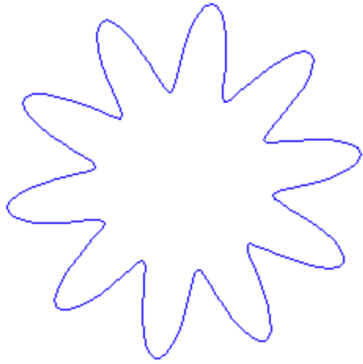
October 10, 2014

**General Directions.** This is an open-book, open-notes, open-computer test. However, you may not communicate with any person, except me, during the test. You have the full class period (50 minutes) in which to do the test. Put your answer to each question in the space provided (use the backs of pages if you need more space). Be sure to **show your work!** I give partial credit for incorrect answers if you show correct steps leading up to them; conversely, I do not give full credit even for correct answers if it is not clear that you understand where those answers come from. Good luck.

This test contains 4 questions on 4 pages.

**Question 1** (10 Points). I have said that variables in Matlab are not quite like variables in mathematics. Give a sequence of 1 or more Matlab statements that produce some output(s) which demonstrates one way in which Matlab variables differ from mathematical variables. Say what output your statements produce, and describe how the difference between Matlab variables and mathematical ones explains that output.

**Question 2** (15 Points). The following is an example of a shape I call a “Math 230 star”:



Math 230 stars are defined by parametric equations of the form

$$x(t) = ( r + p \sin(nt) ) \cos t$$

$$y(t) = ( r + p \sin(nt) ) \sin t$$

where  $r$ ,  $p$ , and  $n$  are constants:  $r$  determines the overall radius of the star,  $p$  the depth of its spikes, and  $n$  the number of spikes.

Write a sequence of one or more Matlab statements that plot a Math 230 star. You may assume that variables  $r$ ,  $p$ , and  $n$  exist, and are assigned values, before your script runs.

**Question 3** (10 Points). Define “flambustigating” a vector of numbers to mean raising the  $i^{\text{th}}$  element to the  $i^{\text{th}}$  power (for all positions  $i$  in the vector), adding up the results, and dividing the sum by the length of the vector. For example, to flambustigate the vector

3 5 2

you would first compute  $3^1$ ,  $5^2$ , and  $2^3$  (i.e., 3, 25, and 8), add the results to get  $3 + 25 + 8 = 36$ , and finally divide by 3 (the length of this vector) to end up with 12.

Write a series of one or more Matlab statements that flambustigate a vector. Assume that the vector to flambustigate is stored in variable  $V$ , which is initialized before your statements execute. Your statements should print the result of flambustigating  $V$ .

**Question 4** (15 Points). Imagine a program in which a vector **V** needs to be “cleaned up” according to the following rules:

- All elements of **V** less than 2 need to be replaced with -1000
- All elements greater than 8 need to be replaced with 1000
- All elements between 2 and 8 (inclusive) should be left unchanged,

For example, if **V** was the vector

4 3 1 5 9 8 -32768

then its cleaned up value would be

4 3 -1000 5 1000 8 -1000

Write a sequence of one or more Matlab statements that cleans up an arbitrary vector **V** (i.e., not just the above example) and places the result in vector **C**.