Math 230 — Hour Exam 1

October 23, 2015

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.

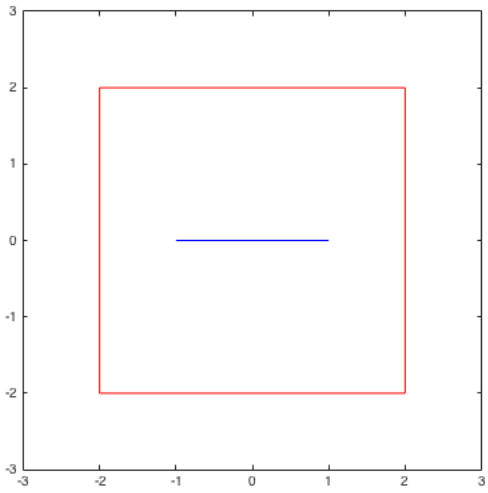
This test contains 4 questions (one with 2 parts) on 4 pages.

Question 1 (5 Points). Write a Matlab expression that calculates and displays the value

$$1 - \frac{x^2}{2!} + \frac{x^4}{4!}$$

Assume that *x* is a variable that has already been assigned a value; you do not need to write code assigning this value.

Question 2 (15 Points). Consider the following plot:



It consists of a blue line from (-1,0) to (1,0), surrounded by a red square whose vertices are at (-2,-2), (-2,2), (2,2), and (2,-2).

Show Matlab code that will produce this plot when run. Your code must include initializations of all variables it uses. You do not, however, need to include code to scale and square the axes the way they are above.

Question 3. Do the following:

Part A (10 Points). Write a Matlab function definition for a function named `q3a` that takes one argument, *x*, and that returns the value of

$$\cos^2 x - \sin^2 x$$

Assume that *x* is an angle in radians.

Part B (5 Points). Write a Matlab expression that calls a function named `q3a` with an argument value of 1 and displays the result.

Question 4 (15 Points). If you invest m dollars at annual interest rate r, the value of the investment after t years is $m(1+r)^t$. Trixi the Time Traveler is considering taking advantage of this fact (and her time machine) by investing an amount of money consisting of between \$1000 and \$2000, in increments of \$1, in the Bank of Eternity for between 100 and 1000 years, in increments of 1 year. The Bank promises to pay an annual interest rate of 1% no matter how long Trixi invests for.

Write a series of Matlab statements that will generate a table giving the final value of every investment Trixi might make (i.e., every amount from \$1000 to \$2000 in \$1-dollar increments, paired with every duration from 100 to 1000 years in 1-year increments). Rows in your table should correspond to dollar amounts of the initial investment, and columns to lengths of the investment. Thus, for example, element (1,1) of your table should be the amount Trixi ends up with if she invests \$1000 for 100 years, element (1,2) is the amount she ends up with if she invests \$1000 for 101 years, element (2,1) is the amount produced by investing \$1001 for 100 years, and so forth.

Your statements should finish with the table in a variable named `values`. Because this code will generate some very big data structures, it should not display the value of `values` or any intermediate variables it creates. Your code should initialize all variables it needs.