Homework 2 Instructions:

- You must include comments in your code.
- It is NOT ok to copy code from the internet and claim it is your own.
- It is NOT ok to share your code with others in this class.
- It is NOT ok to turn in code someone else wrote for you.
- You may only use functions and objects that we have discussed in class so far.
- If your code does not run, you will get a zero on the assignment.
- If your code inputs data from an input file, be sure and include the file on drop box.
- Turn in all problems in an assignment in a single script file, clearly labeling each problem.

NOTE: For this assignment you can use function() but you are not required to do so.

1. Use R to plot the hyperbole $x^2 - y^2/3 = 1$ as shown in Figure 4.3 of the text. Be sure to:
   (a) Plot asymptotes in a contrasting color
   (b) label asymptotes in the same color
   (c) plot foci in a different color
   (d) label foci in the same color
   (e) set the limits for the y-axis to be between -5 and 5
   (f) label the x and y axes
   (g) include a main title with math expressions using command expression()
2. Use a while loop to determine the solution in $[0, 1]$ of $x = \cos(x)$ iteratively.
   (a) Use a starting value of 0.5 and tolerance of .001. Find the number of iterations required.
   (b) Use a starting value of 0.7 and tolerance of .001. Compare the number of iterations required with the previous case.
3. A twin prime is a pair of primes (x, y) such that $y = x + 2$. Construct a list of all twin primes below 1000.

   HINT: First remove all non-primes from the list $2, \ldots, 1000$ using the Sieve of Eratosthenes. The idea is to begin with a vector of numbers 2 to 1000. Beginning with 2, eliminate all

multiples of 2 from the list that are bigger than 2. Then beginning with the next number, in this case 3, remove all multiples of that number greater than 3 from the remaining list. Proceed through all remaining entries in the list in this way. Once you have the list of all primes use a conditional statement to determine whether each prime is a twin prime. Grow your twin primes in a matrix using rbind or cbind.