**9/30 in Class – Review for Exam 1**

I can't review everything in one class period, so this worksheet is NOT exhaustive. (Examples of things not on this worksheet that could be on the exam: projectile motion, drag, friction, `if/else`, `for` loops, and anything else we did homework or in class work on.) Anything we learned, and especially what we have done problems on (both in class and as homework) is fair game for the exam. One exception: animation will not be on the exam.

**Make one .m file for all!**

As practice for the exam, make all of this one .m file. You are welcome to practice first in the command window, and only cut and paste what works into the editor/.m file! Please be sure to put a comment with each problem number in the .m file Call it `review_Yourname.m` and turn it in to me at the end of class.

1. Use MATLAB to evaluate the following:
   (a) 2*3
   (b) 2*3/6*4
   (c) 1/2
   (d) 1\2
   (e) pi
   (f) exp(1)
   (g) sqrt(25)
   (h) sqrt(-25)
   (i) cos(30*pi/180)
   (j) cosd(30)
   (k) cos(pi/2)

2. Use MATLAB to evaluate:
   (a) $e^{-i\pi}$
   (b)
   $$\frac{(2-3)(5+3)}{2-6}$$
   (c)
   $$\frac{\mu_0 I}{2\pi r}$$
   where $\mu_0 = 4\pi \times 10^{-7}$ Tm/A, $I = 3$ A, and $r = 10$cm.
   (d)
   $$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix}$$
   (e) Find the inverse of
   $$\begin{bmatrix} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{bmatrix}$$

3. Write a for loop to sum up the numbers from 1 to 50.

4. Can you "vectorize" that last problem?

5. Write a snippet of code to solve the position kinematic equation for time.

$$\frac{g}{2}t^2 - v_0 t + \Delta y = 0$$

(I rewrote it so it'd be easier to apply the quadratic equation.) As part of the code, check to see if you could get a negative square root. If the roots are positive, output the time(s) you get. If the root would be negative (time imaginary), output a sentence that warns of imaginary time. (Matlab can handle imaginary numbers–however, imaginary time would NOT be a solution in a real world physics problem.)

Test your code with these cases:

(a) $v_0 = +20m/s$, $\Delta y = 0$

(b) $v_0 = +20m/s$, $\Delta y = 10m$

(c) $v_0 = +20m/s$, $\Delta y = 30m$

6. **SHM: horizontal spring**: A mass of 50g is connected to a spring with spring constant $k =$ 10N/m. The mass slides on a horizontal, frictionless surface. I start my clock when I pull the mass 15cm from equilibrium and release it. Recall that for SHM, $a_x \equiv -\omega^2 x and that has a solution$ x = A $\cos(\omega t + \phi)$.

(a) Write Newton's Second Law for the mass, leaving symbols like $k$ and $m$ in your work.

(b) Use your equation and the given expression for SHM to solve for $x(t)$ for this scenario. (Leave symbols still.)

(c) Write a structure plan for how you will write code to find the position of the mass as a function of time.

(d) Go back to the computer and code it! Save it for today, we might need it again.

(e) Plot $x(t)$.

(f) For the practice, make it look nice: axis labels, a title, add a text block somewhere