Part 2

1. The first section creates 3 vectors and plots them vs index values. The second section plots the values against the lengths of the vectors using new formatting techniques that change the colors and patterns of the lines and points. The last section creates matrices by multiplying the different vectors.
2. a) the values in v1 start at 1 and increment by 2 up to 9. The values in v2 start at 4 and decrement by 3 until -8. The values in v3 start at -2.5 and increase by 0.5 until 0.5.

   b)

v1	[1,3,5,7,9]
v2	[4,1,-2,-5,-8]
v3	[-2.5000,-2,-1.5000,-1,-0.5000,0,0.5000]

   c) v1 is blue, v2 is red, and v3 is orange. The horizontal scale represents the index of each value in the list.
3. a) It is more clear that the values are discrete because they are now connected to the x-axis and not one another.

   b) It is harder to see the values because the vertical stems that connect them to the axis are overlapping the point values.

   c) Because they are color coded it is still clear which value belongs to which plot.
4. a) Yes, now it is visible where the distinct points.

   b) In this case the horizontal scale starts at 0 rather than 1 because it has been decremented in the plot
5. a) The first matrix is 5X5, p2 is 1X1, and p3 and p4 are 1X5

```
p1 = 5x5

     4     1    -2    -5    -8
    12     3    -6   -15   -24
    20     5   -10   -25   -40
    28     7   -14   -35   -56
    36     9   -18   -45   -72

p2 = -110
p3 = 1x5

     4     3   -10   -35   -72

p4 = 1x5

    16     1     4    25    64
```

   b)

   c)

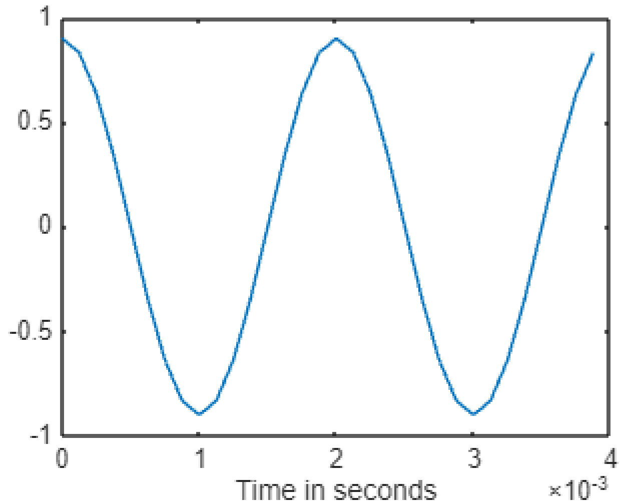
```
p5 = v3.*v2'
p6 = v2'*v3
p7 = v2.*v3'
```

```
p4 = 1x5
      16     1     4    25    64

p5 = 5x7
   -10.0000   -8.0000   -6.0000 ...
    -2.5000   -2.0000   -1.5000
     5.0000    4.0000    3.0000
    12.5000   10.0000    7.5000
    20.0000   16.0000   12.0000

p6 = 5x7
   -10.0000   -8.0000   -6.0000 ...
    -2.5000   -2.0000   -1.5000
     5.0000    4.0000    3.0000
    12.5000   10.0000    7.5000
    20.0000   16.0000   12.0000

p7 = 7x5
   -10.0000   -2.5000    5.0000 ...
    -8.0000   -2.0000    4.0000
    -6.0000   -1.5000    3.0000
    -4.0000   -1.0000    2.0000
    -2.0000   -0.5000    1.0000
          0         0         0
     2.0000    0.5000   -1.0000
```

The resulting product is a 5X7 matrix. The period treats the values as discrete integers rather than a continuous vector. The apostrophe performs a conjugate transposition, swapping diagonal values so that the matrix is inversed.

Part 3

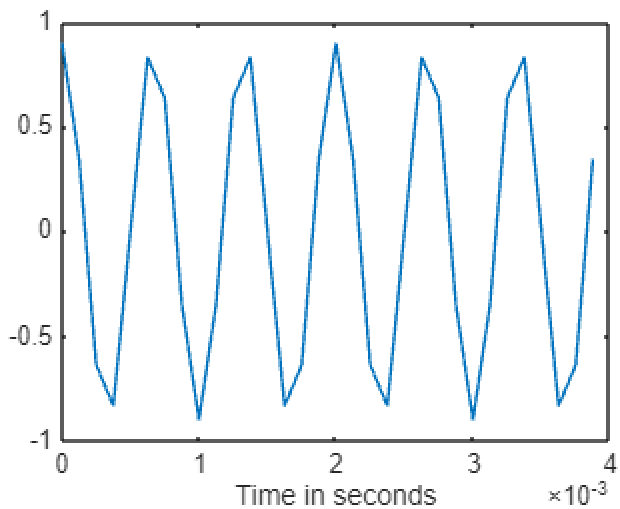
1.
    a. Lines 1-5 initialize variables to be used in plotting the signal. Specifically the Sampling Frequency, signal frequency,n_plot which is how many samples we are using, and Time Step which comes from dividing the Sampling Frequency
    b. Line 6 creates an array of 32 times to sample the wave based off the time step
    c. Line 7 multiples each element in array tvec by 2pi*f1 to get the angles of the wave at each sample
    d. Line 8 finds the cosine of each element of tvec and multiplies it by 0.9 to get the value of the wave at each sample.
    e. Lines 9 and 10 plot the wave on a line graph
    f. Line 11 has us assign 8000 to a var n_sound which is how many samples we need of the sine wave to play the frequency for 1 second
    g. Line 12 creates an array of all the values we are going to sample at
    h. Line 13 does the same as Line 7 except for tvec2
    i. Line 14 does the same as line 8 except it uses the angles from A2
    j. Line 15 plays the sound
2.
    a. 2 cycles are shown in the plot
    b. One period is 2*10 ^ -3 seconds. This is the inverse of the Sampling frequency which is 1/500 = 2*10^3
    c. 32 samples / 2 cycles = 16 samples per cycle
    d. The plot is similar to a standard cosine plot except you can see jagged edges near the amplitudes since this plot is not sampling at infinite points



e.

3.

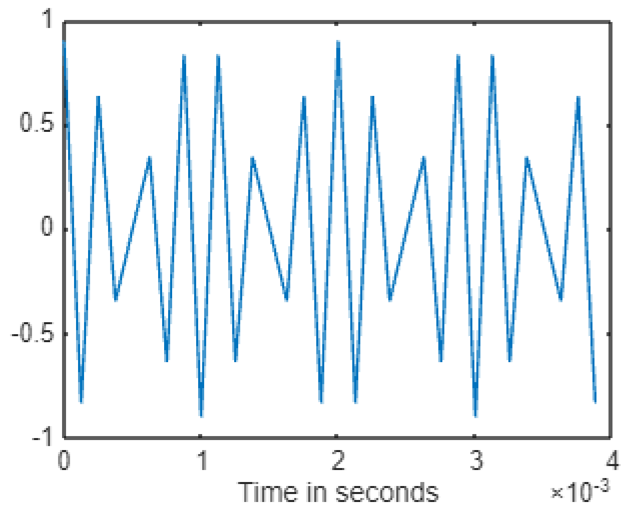
a. The plot has more peaks and is more uneven and jagged



b. The sound has a higher pitch. This is due to the frequency being increased

4.

a. The plot has even more peaks but still has a pattern of a 2 high amplitude peaks and then 2 low amplitude peaks

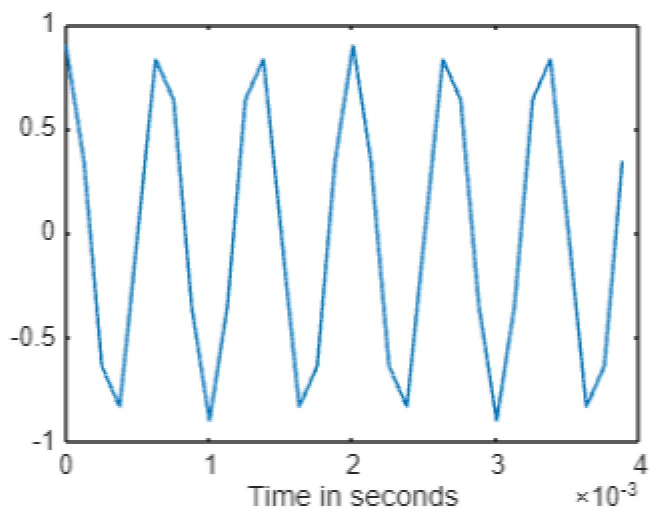


b. The sound is even high pitched

5.

a. 6500

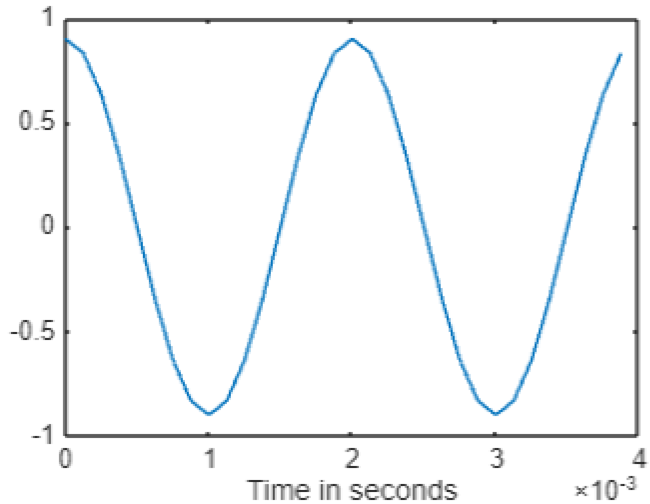
i. This plot is identical to the plot for 1500Hz.



ii. The sound is identical to the sound for 1500Hz

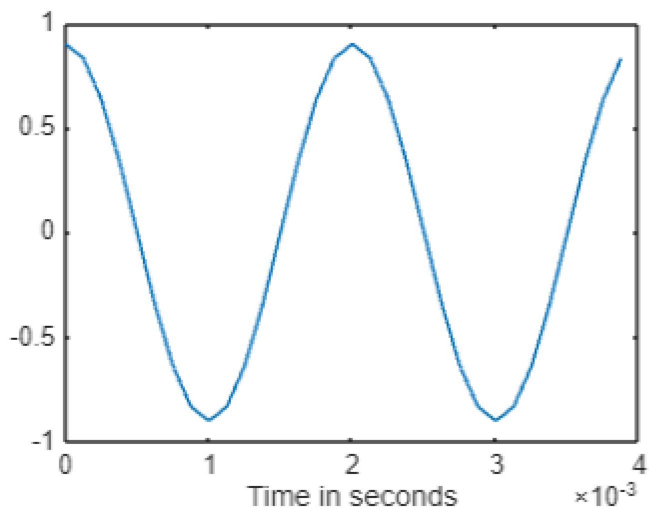
b. 7500

i. The plot is identical to the plot of 500 Hz



ii. The sound is identical to the sound for 500Hz

c. 8500Hz
   i. The plot is identical to 7500Hz and 500Hz



   ii. The sound is identical to the 7500Hz and 500Hz

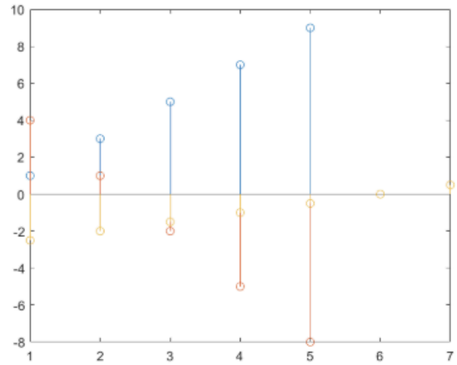
Summary

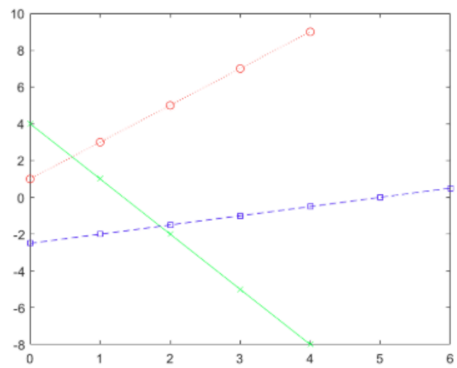
Part 1

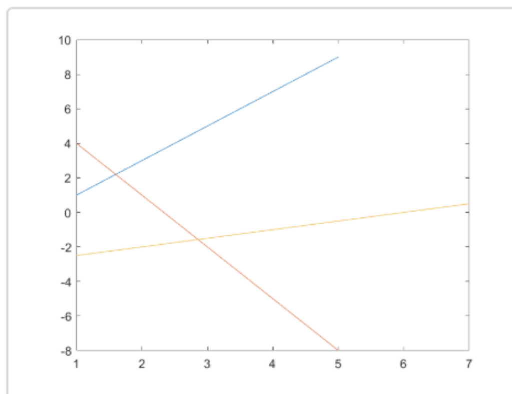
We learned that matlab can be run in the live editor and our variables are visible in the workspace as we perform operations. Outputs can be viewed after running.

Part 2

We found that we can define vectors with their bounds and derivative using colons. We can also see that graphing can be done with either the plot or stem function, depending on the type of graph we want to create. The length function defines the size of a vector. With wplot we can specify more details for our plot to change patterns and colors of graphs. In the final section we saw how matrix multiplication can be performed but requires periods and apostrophes to ensure that the right dimension is created.







Part 3

We saw how a continuous sinusoid can be defined with a frequency and time step value. When plotting this we observe the label function for adding titles to graphs and the cosine function for finding values to plot as a wave. By modifying the timestep and frequency values we saw how the signal plotted would be affected and then used the sound function to play back the sinusoidal signal as an audio output. Here we could hear how frequency affects the pitch when the sound is played back.