Instructions: Create script or function files as directed. To turn in:

- Score Sheet and your answer to #3 (turned in during class)
- Copies of the plots (saved as JPG files and emailed).
  Save each plot as `hw5_1.jpg,` etc.
- your script files to generate the plots, named `hw5_1.m`, etc.(emailed)

The JPG and .m files should be emailed with MATLAB HW5 as the subject line.

1. Plot the following polar plots on one figure using subplot. Be sure that the titles name the curves, or give the equation if it is unnamed. Also be sure to choose the correct domain for each to make sure for each to make sure you produce the entire curve. Plot these using the `polar` command, but have it drawn on a rectangular coordinate system (see examples on H-drive)

   (a) **Nephroid of Freeth** $r = 1 + 2\sin(\theta/2)$;
   (b) **Hippopede** $r = \sqrt{1 - 0.8\sin^2\theta}$;
   (c) **Butterfly Curve** $r = e^{\sin\theta} - 2\cos(4\theta)$;
   (d) $r = \sin^2(4\theta) + \cos(4\theta)$;
   (e) $r = 2 + 6\cos(4\theta)$;
   (f) $r = 2 + 3\cos(5\theta)$

2. The orbit of planets around the sun can be modeled (approximately) by the polar equation below. The values of the constants P and ϵ for four planets are also given below. Plot the orbits of the four planets in one figure using `polar` on the polar plane, making sure to have a legend, title, etc.

$$r = \frac{\epsilon P}{1 - \epsilon\cos\theta}.$$

Planet	$P(\times 10^6$ m)	ϵ
Mercury	269.2	0.206
Venus	15913	0.00677
Earth	8694	0.0167
Mars	2421	0.0934

3. The yield stress (the limit of the elastic range) of most metals is sensitive to the rate at which the material is loaded. The data below gives the yield stress of a certain steel at various strain rates.

Strain Rate (s^{-1})	0.00007	0.0002	0.05	0.8	4.2	215	3500
Yield Stress (MPa)	345	362	419	454	485	633	831

The yield stress as a function of strain rate can be modeled with the equation

$$\sigma_{yld} = 350\left[\left(\frac{\varepsilon_t}{210}\right)^{0.16} + 1\right]$$

where σ_{yld} is the yield stress in MPa, and ε_t is the strain rate in s^{-1}. Make a plot of the yield stress (vertical axis) versus the strain rate (horizontal axis). Show both the model and the data points. Use linear scale for the stress and logarithmic scale for the strain rate. Show the data points as points with a marker and the model as a solid line. Label the axes appropriately and add a legend and title to the plot.

How well do you think the data supports the model? (backup your answer with the graph)