Homework to replace Chapter 6 HW

1. If $F(x) = x + x^2 + \lambda$,
   (a) Determine the fixed points. (They will depend on λ)
   (b) Plot the fixed points, with λ on the horizontal axis, the fixed point locations on the vertical axis.
   (c) Determine the stability of the fixed points and label the graph (e.g., attracting or repelling).
   (d) Determine the period 2 points. Use the Maple example attached to get a function you can plot by hand, and put this on your graph from the previous parts.

2. Use the template program from class to plot and print the bifurcation diagram for $F(x) = \lambda x(1-x)$. Use $x_0 = \frac{1}{2}$ for the initial condition, and plot the result in the window: $0 \leq \lambda \leq 4, 0 \leq x \leq 1$. Hint: For the initial condition, replace `x=zeros(1,1000);` with the line `x=0.5*ones(1,1000);`. Write $F(x)$ as `c.*x.*(1-x)`

3. Let $F(x) = \sin(x) + x + \lambda$.
   (a) For what value(s) of λ do fixed points exist?
   (b) Analyze the stability of the fixed points (attracting/repelling/neutral) at $\lambda = 0$, $\lambda = 1$, $\lambda = -1$.
   (c) Use the information from the previous part to draw a sketch (by hand) of the bifurcation diagram (x vs. λ). Label the stability information.

   Do the last problems below after we've discussed base 3 representations of numbers.

4. Use the sample Matlab code from class to obtain the first 10 digits of the ternary expansion of $\frac{5}{14}$.

5. Use the sums method to get the base 10 representation, if $0.0120120\bar{1}2\ldots$ is the base 3 representation.

6. Use the multiplication method to get the base 10 representation, if $0.1021021\bar{0}21\ldots$ is the base 3 representation.

7. Graphically "decode" the base 3 point: 0.212