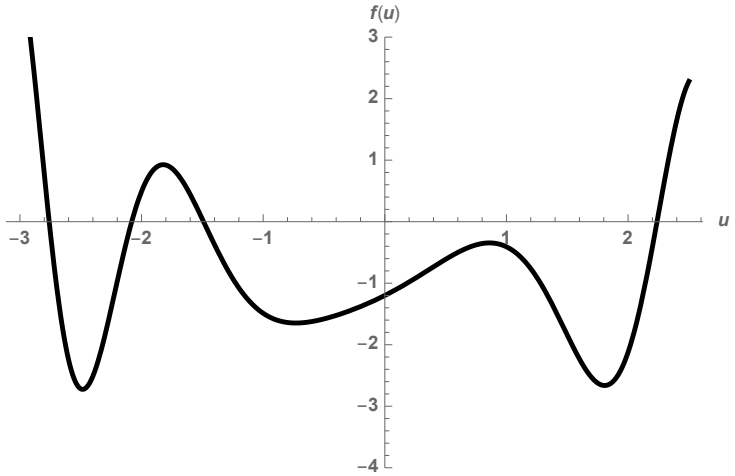
Math 376 Homework Set #5

due Wednesday, May 8

Please do problems #1 - #4 on this sheet, and staple your book problems to this sheet. You must use proper notation and show the appropriate work to earn full credit.

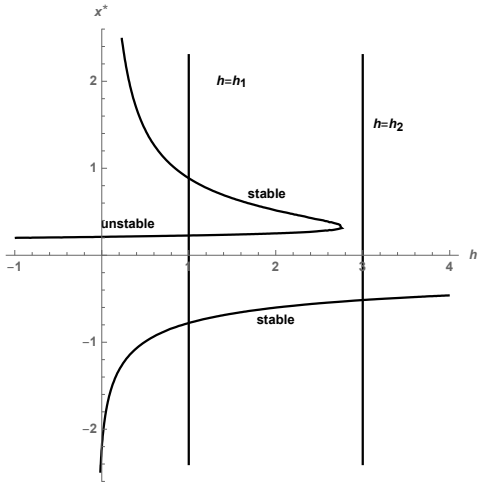
1. (5 points) For the IVP $x' = -x + 3t$, $x(0) = 1$, use Improved Euler's Method with $h = \frac{1}{3}$ and with $h = \frac{1}{30}$ to approximate $x(1)$. Plot both your approximations as well as the actual solutions, and calculate the error between these approximations and the actual solution at $t = 1$. (Note: this is an IVP from a previous homework!) What do you expect the error to be if you used $h = \frac{1}{300}$?

2. (5 points) Suppose the graph of $f(u)$ is given below. Draw the phase line for $u' = f(u)$, and determine the stability of the equilibria solutions.



3. (5 points) Construct a bifurcation diagram for $x' = (x-1)^3 - h(x-1)$, where h is the bifurcation parameter.

4. (5 points) The plot below is a bifurcation diagram for $x' = f(x;h)$. Draw appropriately labelled possible graphs for $x' = f(x;h_1)$ and for $x' = f(x;h_2)$, where h_1 and h_2 are the indicated values of h.



5. (5 points) Book Problems:
   - Sect 2.7 #5