Mathematics 172

Quiz 9 Name: Key

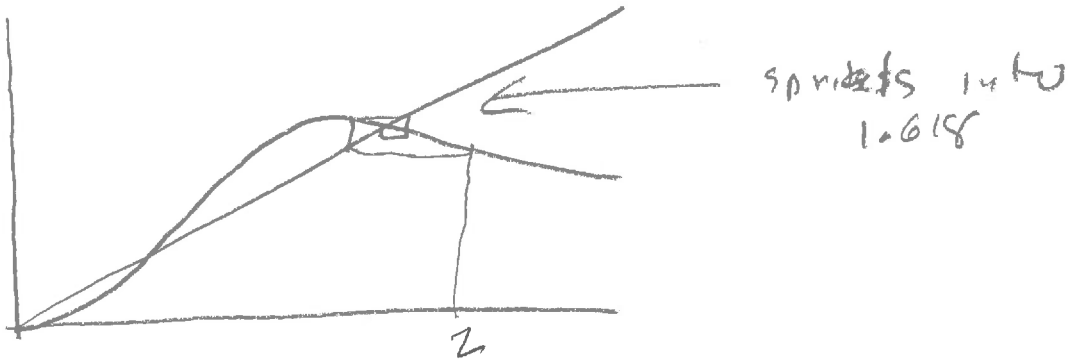
You must show your work to get full credit.

For the discrete dynamical system

$$P_{t+1} = \frac{P_t + 3P_t^3}{2 + P_t^4}$$

we wish to find the equilibrium points and determine if they are stable.

1. To start graph $y = \dfrac{x + 3x^3}{2 + x^4}$ and $y = x$ on the same axis on your calculator with Xmin $= 0$ and Xmax $= 3$ and draw a rough sketch of what you get here.



2. Use your calculator to find the points of intersection of the two graphs. There should be three such points. These are the equilibrium points. Give there values here accurate to 3 decimal places.

The equilibrium points are: 0.000, .618, 1.618

3. Use your calculator to find the values of the derivatives of $f(x) = \dfrac{x + 3x^3}{2 + x^4}$ at the equilibrium points.

f'(smallest equilibrium point) = .500

f'(middle equilibrium point) = 1.769

f'(largest equilibrium point) = −.334

4. The stable equilibrium are: _____

The unstable equilibrium points are: 0.000, 1.618

5. If $P_0 = 2$ estimate P_{100}.

$P_{100} \approx$ 1.618