Math 3301 **Homework Set 3** **10 Points**

Modeling, Part II

For these problems you MUST set up and solve the appropriate IVP(s) in order to receive any credit for the problem. Any decimals must be to at least the 4th decimal place.

1. A population of fish in a pond grows at a rate proportional to its population. There are originally 250 fish in the field and in the absence of any outside factors there will be 1000 fish in 4 months time. Each week there is a net migration of 6 fish out of the pond and the local predators eats 12 fish. Will the fish survive? If not when do they die out? Assume 4 weeks per month for this problem.

2. Take the above situation and after 2 months a disease enters the pond and kills 8 fish per week. Do the fish now survive? Again, if they do not survive when do they die out?

3. A 12 kg object is dropped off a bridge with an initial velocity of 20 cm/sec downwards and the object experience air resistance in the form 2*v* as it falls. If the object hits the ground with a velocity of 30m/s how high was the bridge off the ground?

Equilibrium Solutions

Find and classify the equilibrium solutions for each of the following differential equations.

4. $y' = y^3 - 2y^2 - 8y$

5. $y' = (y-3)^3 (y+2)^4$

Euler's Method

6. Find the approximate value of the solution to the following IVP at $t = 0.6$ using both $h = 0.3$ and $h = 0.15$. All decimal work should be to at least the 4th decimal place.

$$y' + \mathbf{e}^{t-y} = t\,y \qquad y(0) = 2$$