Math 10B Dynamics Worksheet

1. Consider the following differential equation.

$$\frac{dy}{dt} = -8y.$$

   (a) Sketch the slope field corresponding to this equation.

   (b) Find a solution to the equation with initial condition $y(0) = 1$ and add it to your sketch from part (a).

   (c) Use Euler's method with step size 1 to approximate a solution to the differential equation with initial condition $y(0) = 1$. Add this approximate solution to your sketch from part (a).

   (d) Was the approximation in part (c) accurate? What happened?

   (e) Try to find some step size for which Euler's method gives a good approximation of the solution.

2. Suppose X is a random variable that has the Poisson distribution. Given the following independently observed values of X, find a 95% confidence interval for the mean of X: 4,5,7,3,4,5,5,2,6,3.

3. You have an urn which contains 10 balls, each of which is either white or black. You repeatedly perform the following procedure: draw three balls without replacement and count how many are black (after you draw three, you put all three back in the urn before the next trial). You believe that there are not an equal number of white and black balls in the urn. Using the following data, perform a statistical test to check this hypothesis.

Number of black balls	Observed frequency
0	2
1	5
2	7
3	10

4. Suppose you are investigating a crime scene. You have one suspect, Oliver. You have also found two samples of blood at the crime scene. You know that Oliver's blood is type O, which occurs in 60% of the population. You then learn that the two samples of blood found at the crime scene have types O and AB respectively. If type AB occurs in 1% of the population, should learning this new piece fo information increase or decrease your belief that Oliver's blood was found at the crime scene? (Hint: Bayes' theorem.)