**MA 150 Practice Exam 1**

**Spring 2019**

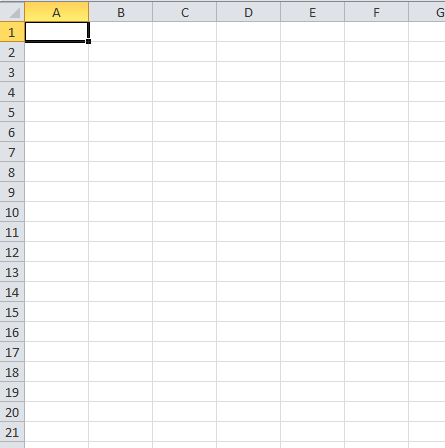
1. For each flow diagram below give the corresponding DDS.

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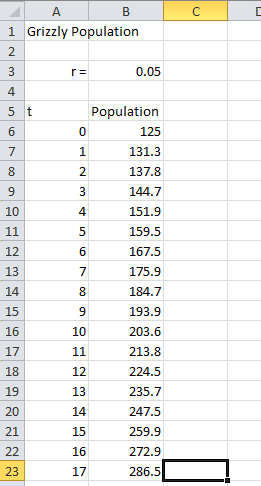
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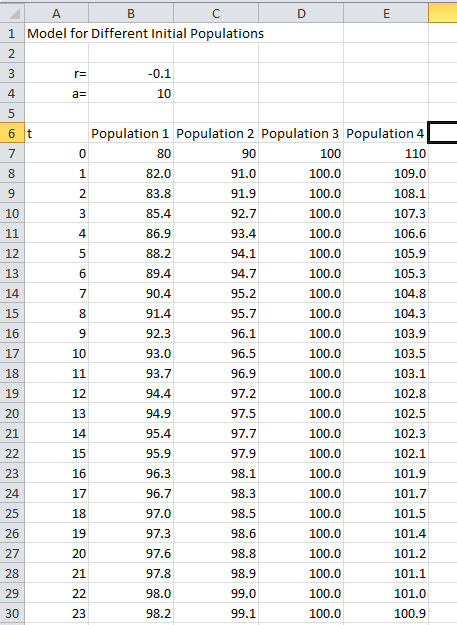
1. For each DDS below give the corresponding flow diagram.
   1. .
2. Suppose a population of condors is decreasing at the rate of 10% every year and that 20 condors are being released into the population each year.
   1. If the current population of condors is 40 find the population one year from today.
   2. Assuming that the population has a stable equilibrium value, what will the long-term population of condors turn out to be if the growth rate and stocking number stay the same?
   3. How many condors would have to be released into the population every year if the long-term goal was to have 500 condors in the population?
3. A population of cranes is decreasing at a rate of 3% per year and 10 cranes are being added to the population each year. The initial population of cranes is 100 in 2014. Set up the Excel spreadsheet you would use to analyze this population below. You must use appropriate labels and Excel syntax.



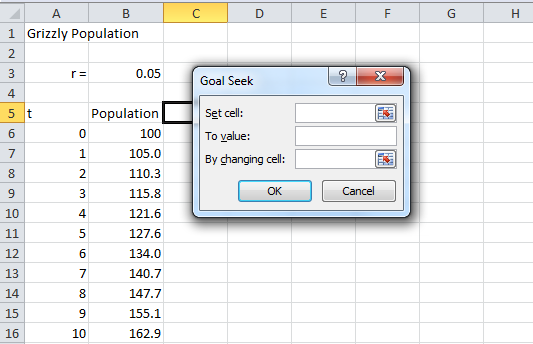
1. The Excel spreadsheet below models a population of grizzlies starting in 1990. Use the Excel output to answer the following questions.
   1. What is the initial population of grizzlies?
   2. Is the population of grizzlies growing or declining? Explain.
   3. How many grizzlies does the model predict for the year 1995?



1. The Excel output below models a population for a variety of different initial populations.
   1. What is the equilibrium value for the population? Explain.
   2. Is the equilibrium value stable or unstable? Explain.



1. Below are two Excel graphs, each showing an equilibrium value of 200. On one graph sketch a population for which the equilibrium is stable and on the other sketch a population for which the equilibrium is unstable.
2. Suppose you need to use Excel to figure out the growth rate that would lead to a population tripling in five years. Fill in the Goal Seek command below that would calculate the correct growth rate.



1. Use an explicit formula to find the growth rate in #8.
2. In a complete sentence or two, explain the pros and cons of using a discrete dynamical system for a model versus using an explicit formula.
3. Consider the Yellowstone grizzly population. In 2002 the population is estimated to be 416 bears, and we assume that . Suppose that 5 grizzlies are illegally poached annually.
   1. Draw a flow diagram for the situation.
   2. Write down the corresponding DDS.
   3. Use an explicit formula calculation to predict the number of grizzlies in 2010 if the poaching continues.
4. Suppose an initial population of 1000 in the year 2010 is growing at the rate of 7% per year and being harvested at the rate of 500 per year.
   1. Use an explicit formula to predict the population in 2020.
   2. Use an explicit formula to find the harvesting number that would result in a population of 1500 in the year 2025.
5. Suppose a population of white-tailed deer is 1,600,000 in 2007 and that on its own, the population would grow by 32% annually. Set up the explicit formula calculation that would determine how many deer should be harvested annually in order to keep the population constant.
6. Determine all equilibrium values for the model given by