We have four examples of real world situations in this class – population growth, decay of radioactive material, compound interest, and temperature modeled by $Q(t) = Q_0e^{kt}$.

1. Say you invest $100 into a bank account that earns 10% interest, compounded continuously. How long will it take for you to earn $300 in interest?

2. Let’s say you have a radioactive isotope with a half life of 100 years. If you start with a sample of 60 mg, how long will it be before there is just 10 mg left?
3. The population of the United States in 1900 was about 76 million. In the year 2000, it was about 282 million. Assuming that population growth in the United States fits an exponential curve (not necessarily a good assumption), what will the population be in the year 2050?

4. Take a potato at 20 degrees. Stick it in an oven at 300 degrees. After 10 minutes, the potato is 40 degrees. How long will it be before the potato reaches 200 degrees?
5. Say a couple has a child, and plans for that child to attend UConn in 18 years. They approximate that tuition will be around $200,000 for four years by that time. Let’s say they have a bank account that earns 5%, compounded continuously. How much do they have to deposit today in order to have $200,000 in 18 years?

6. A radioactive substance decays by 10% in 20 years. How long will it take to decay by 20%?

7. Bacteria are growing. Eww, gross. Anyway, there are 1000 bacteria when they start, and they triple in population every 5 hours. How long until there are 10,000 bacteria?
8. Take a turkey at 180 degrees. Pull it out of the oven, into a room that is 70 degrees. After one hour, the turkey has cooled to 160 degrees. How long until it reaches 150 degrees?

9. A 50 mg sample of radioactive substance decayed to 10 mg in five years. What is the half-life of the isotope?