Exponential Growth and Decay: Examples

1. A bacteria culture begins with 20 cells and grows proportional to its size. After 2 hours, the population has grown to 60 cells. When will the population reach 500 cells?

2. A bacteria culture grows proportional to its size. After 1 hour there are 400 cells, and after 2 hours there are 700 cells. What was the initial population?

3. A certain radioactive substance has a half-life of 30 years. If you begin with a sample of 100 kg, how much will you have after 10 years?

4. You have 50 g of a radioactive substance. After 3 months, you notice that you now only have 45 g. Find the half-life of the substance.

5. You place a turkey in an oven set at 400° F. The turkey is frozen at a temperature of 25° F. One hour later you check its temperature, and it has increased to 75° F. How long will it take for the turkey to reach a temperature of 180° F?

6. After boiling some water and mixing in some chocolate powder, you have a nice hot cup of hot chocolate. However, it is too hot to drink at 200° F. After 10 minutes in a room at 68° F, it has cooled to 180° F. You enjoy your hot chocolate most when it is precisely 160° F. How much longer should you wait to drink it?

7. You purchase a car for $25,000, with an annual interest rate of 2.5%, compounded continuously. Your plan doesn't require you to make payments until 2 years later. How much will you owe when you begin making payments?

8. You make an investment of $10,000 with an interest rate of 1.5% compounded quarterly. How much will your investment be worth after 10 years?

9. How long will it take for an investment to double if it is invested at 5% compounded continuously?

10. You decide to invest for your daughter's college education when she is born. If you invest $5,000 at 3% interest compouned monthly, how much will she have for college when she turns 18?