1.

Newton's Law of Cooling says that  $u(t) = T + (u_0 - T)e^{kt}$ . u(t) is the final temperature, T is the room temperature,  $u_0$  is the initial temperature, k is a constant of cooling, and t is time.

An insulated container can hold the temperature of a liquid from 175 degrees Fahrenheit to 100 degrees Fahrenheit for 90 minutes. If the temperature of the outside is 10 degrees Fahrenheit, how long until the liquid freezes (32 degrees F)?

Need to figure out that k = -0.00673. Then you can find t = 299.18 minutes.

If the same container is used to hold a liquid, how long will it take the liquid to cool from 200 degrees Fahrenheit to 175 degrees Fahrenheit?

### *t* = 20.948 minutes

2. A tree grows at 1.2% continuously. If the tree started at 10cm, how long will it take the tree to grow to 1000cm?

## *t* = 383.764 years

3. A high graduate receives \$750 in graduation gifts. Being a smart student, they quickly deposit all the money into a savings account that offers 4.2% APR, compounded monthly. How much money will the student have in 10 years?

## In 10 years they will have \$1140.63

4. A car is purchased for \$14,500. Each month the car depreciates at 0.98%. The owner wants to sell the car when it has lost half of its value. When should the owner sell the car?

## The owner should sell the car in 70.382 months or 5.865 years.

5. A deadly bacteria was placed in a pietri-dish 10 hours ago and is growing continuously. 6 hours ago, 342 bacteria existed. When a current sample is taken, 924 bacteria exist. Use this information to answer the following questions:

What is the rate of growth for the bacteria? 16.565%

What is the equation that will model this bacteria's growth?  $P(t) = 176.304e^{0.16565t}$ 

When will/did the sample triple? 6.632 hours

6. Given the following function,  $f(t) = 250(0.982)^{t}$ , answer questions:

The function describes the number of insects in a given area over *t* hours.

- a. How many insects were in the area initially? **250** Insects
- b. What will happen to the insects in the long run?
  They will leave the area until there are no insects left.

7. a. Naima's parents would like to save enough money for college because they do not want to take out any loans. When Naima is born, they find a savings account that will give them 2.35% APR, compounded monthly. If they want \$50,000 by the time Naima is 18, how much should they deposit when she is born?

# \$32,767.48

b. After 3 years have gone by, Naima's parents find an account that gives them 2.5% interest annually, compounded continuously. How long will it now take her parents to earn \$50,000?

### 17 years

8. While preparing for the school musical, students in the production noticed the lights on the stage were beginning to over heat so they quickly turned them off. If the temperature of the room started at 104 degrees Fahrenheit and started to cool at 3.6% per minute, when was the temperature of the room at 60 degrees Fahrenheit?

### 15 minutes

9. Sandra deposited \$400 into an account that yields 3.4% APR, compounded continuously. How much money will Sandra have after 7 years?

### \$507.48

10. A population of Detroit Red Wing fans are being hunted and jailed at a rate of 7.6% every day. When will half the population of the fans remain?

## 8.769 Days