Test 2 Review

Loan formula \( PMT = \frac{P \times \left(\frac{APR}{N}\right)}{1 - \left(1 + \frac{APR}{N}\right)^{-NY}} \)

Savings plan formula \( A = PMT \times \frac{(1 + \frac{APR}{N})^{NY} - 1}{\frac{APR}{N}} \)

1. Say Dave borrowed 20,000 dollars to open a grocery store. How much does Dave have to pay to pay off the debt in 3 years if the loan has an APR of 15% and is compounded 20 times per year? How much did Dave pay over the life of the loan? How much did Dave pay in interest over the life of the loan?

2. Sandy decided to start a savings account for her retirement. If she puts away $100 dollars a week for 30 years in an account with an APR of 5% how much money will she have? How much did Sandy put into the account over the 30 years? How much interest did she earn over 30 years? What is the Annual Percentage yield of the savings account?

3. Emilia would like to invest 10,000 dollars in a bank account. There are four different banks that she can choose from. Bank one has an account that has simple interest at 8% a year, Bank two has an account which has interest that is compounded annually at 7.5%, Bank three has an account which has interest that is compounded quarterly at 7.3%, and Bank four has an account that is compounded continuously at 7.25%. Which bank should Emilia choose if she leaves the money alone and wants the greatest amount in her bank account after 3 years, 12 years, 19 years. What is the APY of each account except the simple interest account?

4. The population of deer in Indiana has been growing over the past 20 years after they were hunted to near extinction. If there were 100 deer in Indiana in 1985 and they have been growing at a rate of 4%, how many deer are there in Indiana in 2005? What is the approximate doubling time of the deer? What is the fractional growth rate of the deer population? What is the growth rate of the deer population? Write down a model for the population of the deer at any time t. Using the model find the number of deer in 1970, 1973, and 2050. When will the deer population reach 7.9 times the original amount?

5. Say that you have the following shape made entirely of chocolate. A ball of radius 2in on top of a right circular cylinder with radius .5in and height 4in on top of a cube with side length 5in on top of a rectangular prism with dimensions 6in \( \times \) 12in \( \times \) 1in. What is the volume of chocolate in the shape? If you disassembled the shape what would the surface area of all the pieces added together be? Find the Surface Area to Volume ratio of the sphere, cylinder, cube, and prism seperatly.
6. Say that Bill is 5 feet 11 inches tall. Now medical science has created 2 exact replicas of Bill one which is 5 inches tall and one that is 90 feet tall. Say Bill originally wears circular glasses with a radius of 2 inches in each lens, a 6 inch tall top hat with diameter 5 inches, and a belt that is 1 inch wide and 40 inches long. What will the area of the lenses, the volume of the top hat, and the dimensions of the belt be in each of the replicas of Bill?

7. Say that you have the following shapes, a sphere with radius 5in, a cube with side lengths fo 4.5in, a $4in \times 3in \times 6in$ rectangular prism, and a right circular cylinder with radius 5 and height 4.5. What is the surface area and volume of each shape? Figure out the surface area to volume ratio for each shape. If we scale all the shapes by a factor 7 up and a factor of 4 down which shape will have the biggest surface to volume ratio?

8. Say that the population of Tokyo has a doubling time of 20 years. If the population of Tokyo is 22 million today construct a exponential model for the population as a function of time. What was the population in 2050, 1700, and 1500. When did the population reach 1 million? What is the fractional growth rate r (both exactly and approximately)? What is the growth rate (both exactly and approximately)? Are the approximations valid? Draw a graph that represents this situation.

9. Say that you have a quantity of 8 pounds of a substance in 1950, and 3.5 pounds today. What is the half-life or doubling time of this substance? What is the growth or decay rate of the substance? Write an exponential model and a linear model for this situation. Using these models which model predicts the higher value for all times between 1950 and today, which predicts the higher value after today, and which predicts the higher value before 1950? Draw a graph to represent both models.

10. Bob recently bought a new car that cost 30,000 dollars. If Bob pays a 10% downpayment and takes out a 5 year loan at 7% APR for the remaining cost of the car what will his monthly payments be? If Bob wants to pay the car off in 3 years with the same APR what will his weekly payments be?

11. If Bob had the forthought to think ahead and save up enough money in a savings account for his new car, how much would he have had to put away monthly in an account that is compounded every week with an APR of 4% if he started 4 years before the date he bought the car. Say Bob started the savings account at 12 noon on January 1st, 2000. If Bob payed $ 300 dollars a month into the savings account when could he buy the car?

12. Say that you have a rectangular park that is 120 feet by 300 feet covered in grass except for a circular gazebo of radius 5ft a square pavillion with sides of length 20 feet, and a right triangular parking lot with the two short sides of length 30 feet and 40 feet. What is the area of the grass covered areas in the park? What is the perimeter of the grass covered area? (hint: first draw a picture of what the park looks like)