MATH 1030: Practice Final Exam

The following are practice problems for the final exam.

1. Suppose you can buy wheat in Honolulu for 10 Hons per kilogram. What is the price for wheat in dollars per pound, if 1 dollar is 40 Hons? Remember that 1 kilogram is 2.2 pounds.
   Answer: $0.55 per pound

2. You have 51 M&Ms®, but that is after your brother stole 25% of them. How many did you have before your brother stole them?
   Answer: 68 M&Ms

3. You have $100 from running a lemonade stand over the summer. If you invest it with a hedge fund making 7.2% APR compounded continuously, how much will you have in 25 years?
   Answer: $604.96

4. The distance from the Earth to the Sun is about 150 million kilometers. The diameter of the Sun is about 1.4 million kilometers and the diameter of the Earth is about 12,760 kilometers. You decide to build a scale model of the Sun and the Earth. If you use a racquetball ball (with a 2.25-inch diameter) for the Sun, how large will the model of the Earth be and how far away will it be from the racquetball ball? (Hint: 1 cm is 0.3937 inches.) (Hint: Get everything in same units first. Then find the scale factor for Sun. Using the same scale factor find the radius of moon model.)
   By what factor will the volume of Earth change?
   By what factor does the surface area of the Sun change?
   Model Earth diameter = .0205 inches
   Model Earth-Sun distance = 241.07 inches
   Volume of earth changes by a factor of 8.48×10^{-32}
   Surface area of sun changes by a factor of 1.93×10^{-21}

5. Your cousin's mansion in Maputo was appraised at $450,000 in 2002. Property values have been going up by 5.5% per year.

   (a) How much is your cousin's mansion worth in 2011?
      Answer: $728,592

   (b) Does this situation represent linear or exponential growth?
      Answer: exponential

6. Snow acculmulates during a storm at a constant rate of 3.5 inches per hour. How much snow accumulates in the first 6.3 hours? in the next 3 hours ?
   Answer: 22.05 inches, 10.5 inches.

7. Martians are secretly invading the Earth, and their numbers are doubling every 8 months.

   (a) If there were 10,000 Martians on the Earth at the beginning of 2008, how many were there at the beginning of 2010?
      Answer: 80,000 Martians

(b) The Martians can send their invasion fleet when there are 1,000,000 of them on Earth. If there were 10,000 Martians on the Earth at the beginning of 2008, when will they be able to send their invasion fleet?
Answer: May 2012 (after 4.429 years)

8. A clean-up project is reducing the concentration of a pollutant in the water supply, with a 3.5% decrease per week.

   (a) What is the half-life of the concentration of the pollutant? (Can you use the 70 rule?)
   Answer: 19.45 weeks. Yes, you can use the 70 rule.

   (b) How long will it be before there is only 40% of the original amount of pollutant remaining?
   Answer: 25.72 weeks

9. There are 65 Martians in the US Senate. Of those 65 Martians, 25 are short and 21 are tall. Also, of the 65 Martians, 18 are hairy. There are 10 hairy short Martians and 3 hairy tall Martians.

   (a) Draw a Venn diagram to illustrate this information. Use the symbols T, S, and H to represent the sets of tall, short, and hairy Martians respectively.
   I'm not giving it all away.

   (b) How many Martians in the Senate are not tall, not short, and not hairy?
   Answer: 14

   (c) How many Martians in the Senate are not tall or hairless and short?
   This is phrased poorly. I intended this to be interpreted as not (tall or (hairless and short)) in which case the answer is 29.

10. Because you passed your Math 1030 class in college, you know an account which pays an APR of 7.5% *compounded continuously* will maximize your investment. If you invest $2700 in this account, calculate:

   (a) The amount you have in your account after 1 year.
   Answer: $2910.29

   (b) Your APY for this account.
   Answer: 7.788%

11. Imagine you are the proud parent of a newborn baby girl. You have decided to start a college fund for her through your local bank, which offers an account with quarterly compounding and an APR of 4%. How much must you invest in this account today in order to have $120,000 in 18 years?
Answer: $58,619.50

12. Instead of investing in the account above, you have opted to save your money by making semiannual payments of $300 into a savings plan which has an APR of 3.2%. If you continue to make your payments for the next 18 years, how much money will you have in your savings plan?
Answer: $14,452.80

13. Suppose you did not save enough money for your child's college. So instead you take a loan of $120,000 when she is 18 years old. You are required to repay the loan in 15 years and you have to make quarterly payments at an APR of 5%. Determine the value of these quarterly payments.

Answer: $2854.79