Final Review, MTH 122, Fall 2019

1. A furniture assembly team charge a flat rate of $80 per hour of work and a fixed one-time fee of $150 for each visit.
   a. Write the mathematical equation that models the cost involved of hiring the assembly team for t hours.
   b. What is the cost of a 3-hour job?
   c. Mr. and Mrs. Peterson used the service of this assembly team and payed a total of $550 dollars. How many hours did the team work?

2. Consider the straight line given by $5x - 7y = 35$.
   a. Find the slope and the vertical intercept of the line
   b. Sketch the straight line determined by this equation. Make sure to label the x- and y-intercepts.
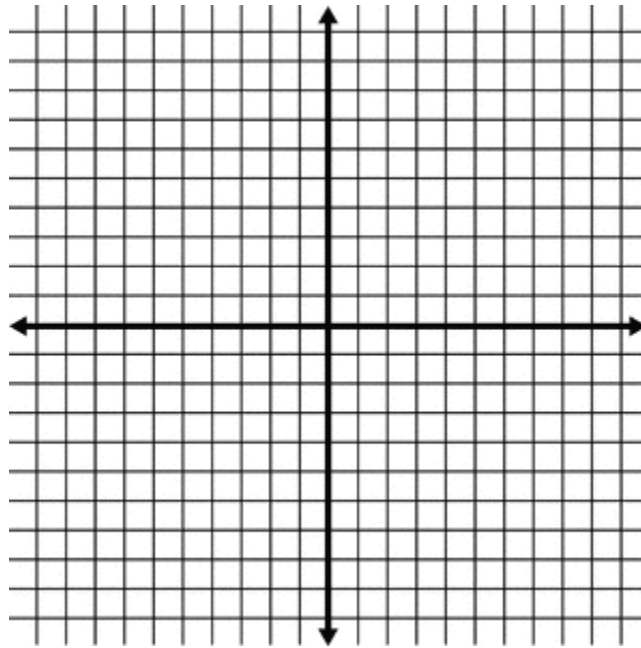
3. The 2008 population of California was 38.0 million and growing at an annual rate of 1.16%.
   a. Find an expression for the population of California at any time t.
   b. What will be the population of California be in the year 2014?
   c. Estimate the doubling time for California's population.

4. In the carbon dating process for measuring the age of objects, carbon-14, a radioactive isotope, decays into carbon-12 with a half-life of 5730 years.

   A fossil is found that has 35% carbon 14 compared to the living sample. How old is the fossil?

5. The total number of Mercedes sales, in millions, in Germany, were 319,163 in 2018 and 326,188 in 2017. It is known that Mercedes sales are best modelled by a linear function of time.

    a. Find the equation for the linear function that can be used to model the situation. State explicitly what your independent variable represents.
    b. What is the practical meaning of the slope of your line?
    c. Use your equation to predict the number of Mercedes sales in Germany in 2014.
    d. When will the number of Mercedes sales in Germany reach 305,000 if the trend continues?

6. Consider the following data set

X	Y
2.75	38
3.41	79
4.52	93
5.20	103
6.10	112

    a. Build a linear regression model based on these data. Determine the correlation coefficient. What does its value suggest about the relationship between X and Y?
    b. Find the equation of the regression line for the data.
    c. Use the regression equation to predict the value of Y for X = 7.5

7. The value of a baseball card is $125. For each of the following scenarios, write a formula for the value C of the card as a function of time t.
    a. The price of the card increased 16% each year.
    b. The price of the card decreased 8% each year.
    c. The price of the card dropped $15 each year.
    d. The price of the card remained steady.

8. The table gives the total number, in thousands, of high school graduates in various years since 1900.

Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Grads	95	156	311	667	1,221	1,200	1,858	2,889	3,043	2,586	2,839

    a. Let t be the number of years since 1890. Determine the best linear function and an exponential function to model the number of high school graduates G as a function of t. (Round all numerical values to three decimal places.)

b. Use each function to predict the number of high school graduates, in thousands, in 2040. (Enter your answer to the nearest thousand graduates.)
c. Use each function to predict when there will be 7 million high school graduates. (Round your answers to the nearest integer.)

9. The pH value of a certain liquid is 9.5. What is its hydrogen-ion concentration?

(Write your answer in scientific notation. Round the decimal value to two places.)
(Remember pH = - log (hydrogen-ion concentration)

10. Given $y = x^2 + 7x - 18$
    a. Find its roots.
    b. Use the roots to write $y = x^2 + 7x - 18$ in factored form.
    c. Find the coordinates of the vertex
    d. Make a sketch of the graph of the given function

11. $f(x) = x^4 - 4x^3 + 5x - 1$
i.   Find the zeros (to the three decimal places) of the given function
ii.   How many turning points are there on the graph? Approximately where do the occur?
iii.   How many inflections point are there on the graph? Approximately where do the occur?

12. A function g is defined in the following table. Use the values given to complete the table.
    (if an answer is undefined, write UNDEF)

x	g(x)	5g(x)	g(x) + 3	g(x-1)	g(2x)	$(g(x))^2$
3	5					
4	1					
5	-2					
6	3					
7	9					

13. The relationship between the mass of an animal and its migration speed is modeled by $V(m) = 9.31m^{0.12}$ where m is the mass of the animal in kilograms and V is the migration speed in kilometers per day.
    (a) determine the migration speed of the bull moose, which typically has a mass of around 650 kilograms.
    (b) What would be the approximate mass of an animal that has a migration speed of 18.2 kilometers per day?