Name: _____ **Date:** _____

Lesson 4 Practice Problems

Section 4.1: Review of Linear Functions

1. Edward the vampire can run at a speed of 70 miles per hour. His girlfriend Bella is 875 miles away from Edward visiting her mom in Phoenix. Edward decides to visit her. Edward's distance, *D*, from Bella *t* minutes after he leaves for his trip can be modeled by the linear function $D(t) = -70t + 875$.

   a) Find the vertical intercept of the function and interpret its meaning in the context of the problem.

   b) Find the horizontal intercept of the function and interpret its meaning in the context of the problem.

   c) Evaluate $D(4)$ and interpret its meaning in the context of the problem.

   d) Find the *t* value for which $D(t) = 504$ and interpret its meaning in the context of the problem.

e) Is the function D increasing or decreasing? How do you know?

f) Determine the slope or rate of change of the function D (Be sure to also include the units). What does the rate of change represent in the context of the problem?

g) Determine the practical domain and practical range of this function. Assume that $t \geq 0$ and that Edward stops traveling when he reaches Bella in Phoenix.

Practical Domain: _____ $\leq t \leq$ _____

Practical Range: _____ $\leq D(t) \leq$ _____

Section 4.2: Average Rate of Change

2. For each of the following functions, determine if the function is linear. If it is linear, give the slope.

a)

x	−3	−2	−1	0	1	2	3
$f(x)$	2	4	8	16	32	64	128

b)

x	−3	−2	−1	0	1	2	3
$g(x)$	−2	0	2	4	6	8	10

c)

t	−4	−1	2	5	8	11	14
$s(t)$	28	19	10	1	−8	−17	−26

d)

x	−4	−2	0	2	4	6	8
$h(x)$	5	6	7	8	9	10	11

e)

n	−4	−1	5	6	8	9	12
$p(n)$	−4	−2	0	2	4	6	8

3. The data below represent the number of times your friend's embarrassing YouTube Video has been viewed per hour since you uploaded it. The data are exactly linear.

Time, t, in hours	0	1	2	3	4
Views, V, in thousands	0	6200	12400	18600	24800

a) Identify the vertical intercept and average rate of change for the data.

b) Use your results from part a) to write the linear function that represents the data table. Use the indicated variables and proper function notation.

c) Use your function to determine the number of views in hour 8. Write your final result as a complete sentence.

d) Use your function to determine how many hours until the number of views reaches 100,000. Round to the nearest whole hour. Write your final result as a complete sentence.

4. You adopted an adult cat four years ago. The data below represent your cat's weight for four years she's lived with you. The data are exactly linear.

Time, t, in years	0	1	2	3	4
Weight, W, in pounds	6	7.25	8.5	9.75	11

a) Identify the vertical intercept and average rate of change for the data.

b) Use your results from part a) to write the linear function that represents the data table. Use the indicated variables and proper function notation.

c) Use your function to determine how much the cat will weigh in year 8. Write your final result as a complete sentence.

d) Use your function to determine how many years it would take for your cat to reach 20 pounds. Round to the nearest whole year.

5. Data below represent how many pushups Tim can do in a minute at the start of a 5-week exercise program and each week thereafter.

Time, t, in weeks	0	1	2	3	4	5
Number of Pushups in a minute	2	6	10	14	18	20

a) Compute the average rate of change for weeks 0 through 3. Be sure to include the unit of your answer.

b) Compute the average rate of change for weeks 1 through 4. Be sure to include the unit of your answer.

c) Compute the average rate of change for the whole 5 – week period (weeks 0 through 5). Be sure to include the unit of your answer.

d) What is the meaning of the average rate of change in this situation?

e) Do the data points in the table define a perfectly linear function? Why or why not?

6. You decided to save up for a vacation to Europe by throwing all your loose change in a large coffee can. After a few months, you discover that the jar is 2 inches full and contains $124.

   a) Determine the average rate of change, in $/inch (Dollars per inch), for the coffee can from when it was empty (0 inches) to when it was 2 inches deep.

   b) A month later, you check the can and find the change is 3 inches deep and adds up to $186. Find the average rate of change, in $/inch, for the coffee can from 0 inches to 3 inches.

   c) What is the *meaning* of the average rate of change in this situation?

   You do some additional calculations and create a table for the can of change.

d, depth of the change in inches	V, value of the can in dollars
0	0
2	124
3	186
5	310
10	620

   d) Use the information found so far to write an equation that describes this situation. Use function notation and the variable names from the table.

   e) You need $1000 for your vacation. In a complete sentence, state how deep the change has to be to reach your goal. Also, write the results as an ordered pair and in function notation.

Section 4.3: Scatterplots on the Graphing Calculator

7. Use your graphing calculator to create of scatterplot of the data set shown below. Be sure to use an appropriate viewing window.

x	1	3	4	6	7	9	10
y	437	886	1097	1558	1768	2217	2437

In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.

Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

8. Use your graphing calculator to create of scatterplot of the data set shown below. Be sure to use an appropriate viewing window.

x	2	9	14	23	33	42
y	60.2	130.1	243.7	328.9	580.5	643.8

In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.

Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

Section 4.4: Linear Regression

9. The following table shows the number of newspaper subscriptions in Middletown, USA where *t* represents the number of years since 2002 (t = 0 in 2002) and *S(t)* represents the total subscriptions each year measured in thousands.

t (year)	0	2	4	6	8
S(t) (total subscriptions in 1000's)	448	372	198	145	45

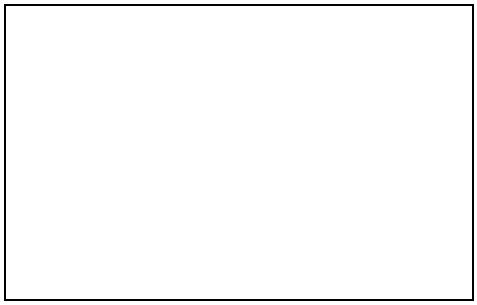
a) Use your calculator to determine the equation of the *regression line*. (Round to 2 decimal places)

Determine the regression equation in $y = ax + b$ form and write it here:

Rewrite the regression equation in $S(t) = at + b$ form and write it here:

b) Use your graphing calculator to create of scatterplot of the data set and the linear regression equation. Be sure to use an appropriate viewing window.

In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.



Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

c) Based on your graph above, do the data appear to be exactly linear, approximately linear or not linear? Explain.

d) What is the slope of your regression model for $S(t)$ and what is its meaning in the context of this problem?

e) What is the vertical intercept of your linear regression model for $S(t)$ and what is its meaning in the context of the problem.

f) Use your linear regression equation to estimate the total number of subscriptions in 2007 (i.e. when t =5).. Show your computations here and your final result.

g) Use your linear regression equation to estimate the total number of subscriptions in 2004. How does this value compare to the data value in the table?

h) Use your linear regression equation to estimate the year in which the circulation will be 100,000. Round to the closest whole year. (Reminder: $S(t)$ is measured in thousands so solve $S(t) = 100$).

10. Scott is hiking the Appalachian Trail from Georgia to Maine. The distance of his hike is 2200 miles. It took Scott 123 days to complete the hike. The data below represent the distance, D, he had hiked t days after the start of his trip.

t (days hiking)	0	32	47	73	99	123
D(t) (distance in miles)	0	590	912	1212	1876	2200

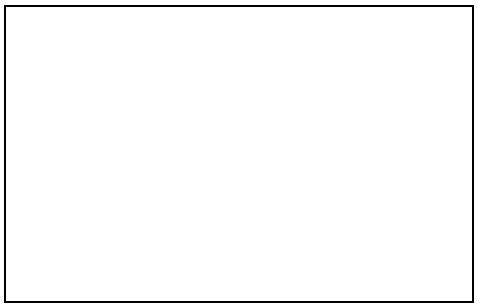
a) Use your calculator to determine the equation of the *regression line*. (Round to 2 decimal places)

Determine the regression equation in $y = ax + b$ form and write it here:

Rewrite the regression equation in $D(t) = at + b$ form and write it here:

b) Use your graphing calculator to create of scatterplot of the data set and the linear regression equation. Be sure to use an appropriate viewing window.

In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.



Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

c) Based on your graph above, do the data appear to be exactly linear, approximately linear or not linear? Explain.

d) What is the slope of your regression model for $D(t)$ and what is its meaning in the context of this problem?

e) Use your linear regression equation to estimate the total number of miles Scott has hiked in 50 days. Show your computations here and your final result.

f) Use your linear regression equation to estimate when Scott has hiked 1000 miles.

11. Your turn. Create a story problem where the data change linearly and then create a table that has data points for that story.

    a) Write the story problem.

    b) Create a table for the story problem. Make sure you use Function Notation.

    c) Compute the average rate of change for your data. Be sure to include units.

    d) What is the meaning of the average rate of change in this situation?

    e) Determine the vertical intercept for your data. What is the meaning of this vertical intercept?

    f) Use the vertical intercept and the rate of change to write the linear function model for the data. Use proper variable names and proper function notation.

    g) Write a **read the data** question given the input. Write your question as a complete sentence and in function notation.

    h) Write a **read the data** question given the output. Write your question as a complete sentence and in function notation.

i) Write a **read between the data (Interpolating the Data)** question given the input. Write your question as a complete sentence and in function notation.

j) Write a **read between the data (Interpolating the Data)** question given the output. Write your question as a complete sentence and in function notation.

k) Write a **read beyond the data (Extrapolating the Data)** question given the input. Write your question as a complete sentence and in function notation.

l) Write a **read beyond the data (Extrapolating the Data)** question given the output. Write your question as a complete sentence and in function notation.

Section 4.5: Multiple Ways to Determine the Equation of a Line

12. Sara is selling Girl Scout cookies. They cost $4 per box. The table below shows how much money Sara has earned, E, based on the number of days, t, she has been selling cookies.

t	0	2	3	7	12
E(t)	0	96	144	336	576

a) Find the average rate of change for the following pairs of t values.

i. t = 0 and t = 2

ii. t = 2 and t = 7

iii. t = 3 and t = 12

b) Based on your answers to part a), is it possible that the data are exactly linear? Explain.

c) Create a scatterplot for the data on your calculator. In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.

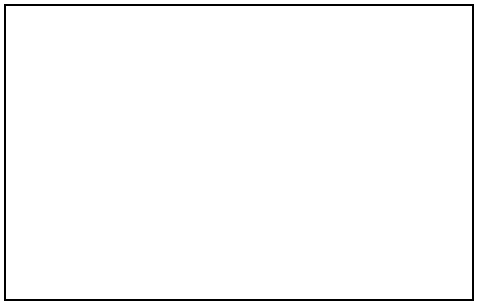
Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

d) Based on your answer to part c), do the data appear to be exactly linear, approximately linear or not linear? Explain.

e) Use your graphing calculator to find a linear regression model for the data. Record the equation below. Also draw a sketch of the line with the scatterplot below.

Regression Equation:_____ (*form: E(t) = mt + b*)



Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

f) Does the regression equation fall *exactly* on the data points, *approximately near* the data points or *not aligned* to the data points? Explain.

g) Explain the meaning of the slope of your regression equation. How does it compare to the average rate of change you found in *part a*?

13. Jose is recording the average daily temperature for his science class during the month of June in Phoenix, Arizona. The table below represents the average daily temperature *t* days after June 1st.

t	0	1	3	5	8	10
D(t)	95	97	98	105	96	90

a) Find the average rate of change for the following pairs of t values.

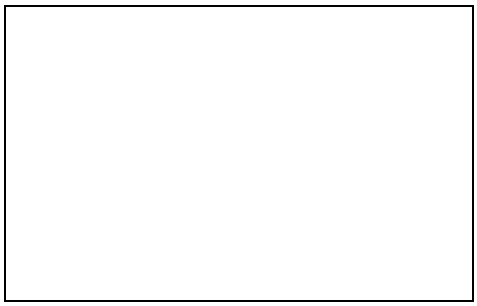
i. t = 0 and t = 1

ii. t = 1 and t = 5

iii. t = 3 and t = 10

b) Based on your answers to part a, is it possible that the data are exactly linear? Explain.

c) Create a scatterplot for the data on your calculator. In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.



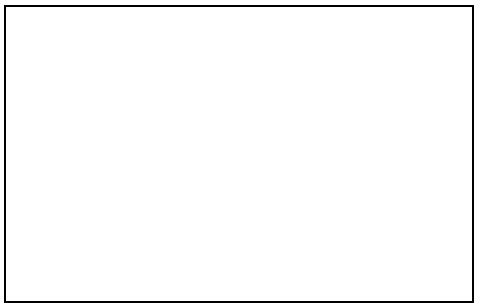
Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

d) Based on your answer to part c), do the data appear to be exactly linear, approximately linear or not linear? Explain.

e) Use your graphing calculator to find a linear regression model for the data. Record the equation below. Also draw a sketch of the line with the scatterplot below.

Regression Equation:_____ (*form: D(t) = mt + b*)



Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

f) Does the regression equation fall *exactly* on the data points, *approximately near* the data points or *not aligned* to the data points? Explain.

g) Do you think the regression model fits the data well? Explain.

14. Tamara is collecting donations for her local food bank. The data below represents the pounds of food, *P,* in the food bank t days after November 1st.

t	0	1	3	6	12	15
P(t)	123	133	152	184	147	274

a) Find the average rate of change for the following pairs of t values.

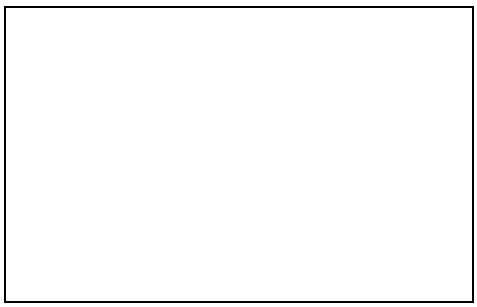
i. t = 0 and t = 1

ii. t = 1 and t = 6

iii. t = 3 and t = 15

b) Based on your answers to part a, is it possible that the data are exactly linear? Explain.

c) Create a scatterplot for the data on your calculator. In the space below, sketch what you see on your calculator screen, and write down the viewing window you used.



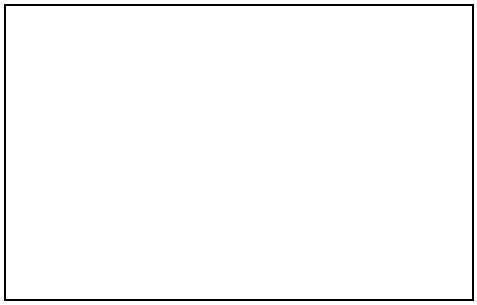
Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

d) Based on your answer to part c) do the data appear to be exactly linear, approximately linear or not linear? Explain.

e) Use your graphing calculator to find a linear regression model for the data. Record the equation below. Also draw a sketch of the line with the scatterplot below.

Regression Equation:_____ (*form: D(t) = mt + b*)



Viewing Window:

Xmin:_____
Xmax:_____
Ymin:_____
Ymax:_____

f) Does the regression equation fall *exactly* on the data points, *approximately near* the data points or *not aligned* to the data points? Explain.

g) Do you think the regression model fits the data well? Explain.