Regression Practice

Curve Fitting with Linear Models

Solve.

1. Vern created a website about his school’s sports teams. He has a hit counter on his site that lets him know how many people have visited the site. The table shows the number of hits the site received each day for the first two weeks. Make a scatter plot for the data using the day as the independent variable. Sketch a line of best fit and find its equation.

<table>
<thead>
<tr>
<th>Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hits</td>
<td>5</td>
<td>10</td>
<td>21</td>
<td>24</td>
<td>28</td>
<td>36</td>
<td>33</td>
<td>21</td>
<td>27</td>
<td>40</td>
<td>46</td>
<td>50</td>
<td>31</td>
<td>38</td>
</tr>
</tbody>
</table>

2. A photographer hiked through the Grand Canyon. Each day she filled a photo memory card with images. When she returned from the trip, she deleted some photos, saving only the best. The table shows the number of photos she kept from all those taken for each memory card.

   a. Use a graphing calculator to make a scatter plot of the data. Use the number of photos taken as the independent variable.
   b. Find the correlation coefficient.
   c. Write the equation of the line of best fit.
   d. Predict the number of photos this photographer will keep if she takes 200 photos.

<table>
<thead>
<tr>
<th>Photos Taken</th>
<th>Photos Kept</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>25</td>
</tr>
<tr>
<td>128</td>
<td>31</td>
</tr>
<tr>
<td>140</td>
<td>39</td>
</tr>
<tr>
<td>157</td>
<td>52</td>
</tr>
<tr>
<td>110</td>
<td>21</td>
</tr>
<tr>
<td>188</td>
<td>45</td>
</tr>
<tr>
<td>170</td>
<td>42</td>
</tr>
</tbody>
</table>

3. What is the relationship between the slope of a line and its correlation coefficient?
Homework: Relation/Functions

Directions: State whether the following relations are functions (continuous or not?). Give the domain and range of the following relations. State the intervals in which the function is increasing, decreasing, or constant. Use Interval Notation.

Function? Continuous? Domain: Range: Increasing: Decreasing: Constant:

Function? Continuous? Domain: Range: Increasing: Decreasing: Constant:
2.7 Homework Pgs. 117-119 on Piecewise Functions

9. Graph the function.

\[ f(x) = \begin{cases} 
2x + 1, & \text{if } x < 1 \\
-x + 4, & \text{if } x \geq 1 
\end{cases} \]

Range:

21. Graph the function

\[ f(x) = \begin{cases} 
2x, & \text{if } x \geq 1 \\
-x + 3, & \text{if } x < 1 
\end{cases} \]

Range:

10. Graph the function.

\[ f(x) = \begin{cases} 
4, & \text{if } 0 \leq x < 2 \\
5, & \text{if } 2 \leq x < 4 \\
6, & \text{if } 4 \leq x < 6 
\end{cases} \]

Range:

22. Graph the function.

\[ f(x) = \begin{cases} 
x + 6, & \text{if } x \leq -3 \\
-\frac{2}{3}x - 3, & \text{if } x > -3 
\end{cases} \]

Range:

24. Graph the function.

\[ f(x) = \begin{cases} 
-x, & \text{if } x > 2 \\
x - 4, & \text{if } x \leq 2 
\end{cases} \]

Range:

26. Graph the function

\[ f(x) = \begin{cases} 
x - 8, & \text{if } x < 9 \\
\frac{1}{3}x - 2, & \text{if } x \geq 9 
\end{cases} \]

Range:
**Evaluating Functions** Evaluate the function for the given value of \( x \).

\[
\begin{align*}
   f(x) &= \begin{cases} 
   5x - 1, & \text{if } x < -2 \\
   x - 9, & \text{if } x \geq -2 
   \end{cases} \\
   h(x) &= \begin{cases} 
   \frac{1}{2}x - 10, & \text{if } x \leq 6 \\
   -x - 1, & \text{if } x > 6 
   \end{cases}
\end{align*}
\]

14. \( f(-2) \) 
16. \( f(5) \) 
18. \( h(-10) \) 
20. \( h(6) \)

Write Equations for the piecewise function whose graph is shown.

35. \( f(x) = \)

36. \( f(x) = \)

37. \( f(x) = \)

38. \( f(x) = \)

39. \( f(x) = \)

**Amusement Park Rates** The admission rates at an amusement park are as follows.

- Children 5 years old and under: free
- Children over 5 years and up to (and including) 12 years: $5.00
- Children over 12 years and up to (and including) 18 years: $12.00
- Adults: $18.00

Write a piecewise function that gives the admission price for a given age. Graph the function.
Systems of Inequalities

Algebra 2 Honors

**SOUVENIRS** Emily wants to buy turquoise stones on her trip to New Mexico to give to at least 4 of her friends. The gift shop sells stones for either $4 or $6 per stone. Emily has no more than $30 to spend.

1. Make a graph showing the numbers of each price of stone Emily can purchase.

2. List three possible solutions.

\[
\begin{align*}
\text{Turquoise Stones} \\
\text{$4$ Stones} & 10 & 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\text{$6$ Stones} & -10 & -10 & -10 & -10 & -10 & -10 & -10 & -10 & -10 & -10 \\
\end{align*}
\]

**FITNESS** Diego started an exercise program in which each week he works out at the gym between 4.5 and 6 hours and walks between 9 and 12 miles.

2. Make a graph to show the number of hours Diego works out at the gym and the number of miles he walks per week.

3. Make a graph to show the number of hours Diego works out at the gym and the number of miles he walks per week.

4. List three possible combinations of working out and walking that meet Diego's goals.

\[
\begin{align*}
\text{Diego's Routine} \\
\text{Walking (miles)} & 16 & 12 & 8 & 4 & 0 & 2 & 4 & 6 & 8 & 10 \\
\text{Gym (hours)} & 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 10 \\
\end{align*}
\]

\[
\begin{align*}
\left\{ 
\begin{array}{l}
y \geq \frac{3}{2}x + 1 \\
y \geq -2x - 3
\end{array}
\right.
\]

\[
\begin{align*}
\left\{ 
\begin{array}{l}
x - 2y > 4 \\
x - 3y < 6
\end{array}
\right.
\]
5. \[\begin{align*}
&x < 3 \\
&y > \frac{1}{2} x - 1
\end{align*}\]

6. \[\begin{align*}
&y \geq -3 \\
&y \geq 3x - 2
\end{align*}\]

7. \[\begin{align*}
&-3x + 2y \leq 6 \\
&2x + 5y \geq 10
\end{align*}\]

8. \[\begin{align*}
&2x + y < 8 \\
&2x - 5y < 20
\end{align*}\]

9. \[\begin{align*}
&y \leq -4x + 6 \\
&y < 3x - 1 \\
&y \geq -2x - 3
\end{align*}\]

10. \[\begin{align*}
&x + y < 1 \\
&2x - y < 4 \\
x \geq -2
\end{align*}\]
Optimization with Linear Programming HW

Graph each system of constraints. Name all vertices. Then find the values of \( x \) and \( y \) that maximize or minimize the objective function.

1. \[
\begin{align*}
\begin{cases}
    x + 2y &\leq 6 \\
    x &\geq 2 \\
    y &\geq 1
\end{cases}
\end{align*}
\]

Minimum for \( C = 3x + 4y \)

2. \[
\begin{align*}
\begin{cases}
    x + y &\leq 5 \\
    x + 2y &\leq 8 \\
    x &\geq 0 \\
    y &\geq 0
\end{cases}
\end{align*}
\]

Maximum for \( P = x + 3y \)

3. \[
\begin{align*}
\begin{cases}
    x + y &\leq 6 \\
    2x + y &\leq 10 \\
    x &\geq 0 \\
    y &\geq 0
\end{cases}
\end{align*}
\]

Maximum for \( P = 4x + y \)
4. A glass blower can form 8 simple vases or 2 elaborate vases in an hour. In a work shift of no more than 8 hours, the worker must form at least 40 vases.

Define the Variables: \( x = \) the hours forming simple vases
So \( y = \) the hours forming ________ vases

Step 1: Write the Inequalities (Constraints) on the lines below and Graph them.
(Remember \# of hours forming simple vases can’t be negative) so _____________________
(Remember \# of hours forming elaborate vases can’t be negative) so _____________________

Step 2: Find vertices of the feasible region. _______ _______ ________ ________

If the glass blower makes a profit of $30 per hour worked on the simple vases and $35 per hour worked on the elaborate vases, write a function for the total profit on the vases.

Step 3: Test vertices (of feasible region) in the Objective Function (PROFIT function).

Find the number of hours the worker should spend on each type of vase to maximize profit. What is that profit?
5. Each car on a freight train can hold 4200 pounds of cargo and has a capacity of 480 cubic feet. The freight service handles two types of packages: small—which weigh 25 pounds and are 3 cubic feet each, and large—which are 50 pounds and are 5 cubic feet each. The freight service charges $5 for each small package and $8 for each large package.

Define the Variables: \( x = \text{the __________________________} \)

So \( y = \text{the __________________________} \)

Step 1: Write the Inequalities (Constraints) on the lines below and Graph them.

_______________________
_______________________
_______________________
_______________________

Step 2: Find vertices of the feasible region. \( \) \( \) \( \) \( \) \( \)

Step 3: Test vertices (of feasible region) in the Objective Function (REVENUE function).

Find the number of each type of package that should be placed on a train car to maximize revenue. AND what is the maximum revenue per train car?

In this situation, is maximizing the revenue the best thing to do for the company? Explain.
**Extra Practice**

**Algebra 2**  
**Linear Piecewise Functions**

Evaluate the function for the given value of \( x \).

\[
\begin{align*}
  f(x) &= \begin{cases} 
  3, & \text{if } x \leq 0 \\
  2, & \text{if } x > 0
  \end{cases} \\
  g(x) &= \begin{cases} 
  x + 5, & \text{if } x \leq 3 \\
  2x - 1, & \text{if } x > 3
  \end{cases} \\
  h(x) &= \begin{cases} 
  \frac{1}{2}x - 4, & \text{if } x \leq -2 \\
  3 - 2x, & \text{if } x > -2
  \end{cases}
\end{align*}
\]

1. \( f(2) \)  
2. \( f(-4) \)  
3. \( f(0) \)  
4. \( f\left(\frac{1}{2}\right) \)

5. \( g(7) \)  
6. \( g(0) \)  
7. \( g(-1) \)  
8. \( g(3) \)

9. \( h(-4) \)  
10. \( h(-2) \)  
11. \( h(-1) \)  
12. \( h(6) \)

Write the piecewise function for the given graph. State if the graph is continuous or discontinuous.

13.  
14.  
15.  
16.  
17.  
18.

Graph the function. State if the graph is continuous or discontinuous.

19. \[
  f(x) = \begin{cases} 
  x + 3, & \text{if } x \leq 0 \\
  2x, & \text{if } x > 0
  \end{cases}
\]

20. \[
  f(x) = \begin{cases} 
  x + 1, & \text{if } x < 0 \\
  -x + 1, & \text{if } 0 \leq x \leq 2 \\
  x - 1, & \text{if } x > 2
  \end{cases}
\]
21. \[ f(x) = \begin{cases} 
2, & \text{if } x \leq -3 \\
-1, & \text{if } -3 < x < 3 \\
3, & \text{if } x \geq 3 
\end{cases} \]

22. The admission rates at an amusement park are as follows.
   - Children 5 years old and under: free
   - Children older than 5 years and less than or equal to 12 years: $10.00
   - Children older than 12 years and less than or equal to 18 years: $25.00
   - Adults (older than 18 years): $35.00

   a) Write a piecewise function that gives the admission price for a given age.
   b) Graph the function.
1. PETS Renée’s Pet Store never has more than a combined total of 20 cats and dogs and never more than 8 cats. This is represented by the inequalities \( x \leq 8 \) and \( x + y \leq 20 \). Solve the system of inequalities by graphing.

2. RECREATION Maria had $150 in gift certificates to use at a record store. She bought fewer than 20 recordings. Each tape cost $5.95 and each CD cost $8.95. How many of each type of recording might she have bought?

3. FUND RAISING The Camp Courage Club plans to sell tins of popcorn and peanuts as a fundraiser. The Club members have $900 to spend on products to sell and want to order up to 200 tins in all. They also want to order at least as many tins of popcorn as tins of peanuts. Each tin of popcorn costs $3 and each tin of peanuts costs $4. Write a system of equations to represent the conditions of this problem.

4. WAGES The minimum wage for one group of workers in Texas is $7.25 per hour effective Sept. 1, 2008. The graph below shows the possible weekly wages for a person who makes at least minimum wages and works at most 40 hours. Write the system of inequalities for the graph.

5. BUSINESS For maximum efficiency, a factory must have at least 100 workers, but no more than 200 workers on a shift. The factory also must manufacture at least 30 units per worker.

   a. Let \( x \) be the number of workers and let \( y \) be the number of units. Write four inequalities expressing the conditions in the problem given above.

   b. Graph the systems of inequalities.

   c. List at least three possible solutions.
1. The Spirit Club is selling shirts and banners. They sell at most 400 of the two items. To meet the demands of the students, they must sell at least 50 t-shirts and 100 banners. The profit on each shirt is $4.00 and the profit on each banner is $1.50, the equation $P(t, b) = 4.00t + 1.50b$ can be used to represent the profit. How many should they sell of each to maximize the profit?

Write the inequalities to represent this situation.

Find the vertices of the figure formed.

What is the maximum profit the Spirit Club can make?
Extra Practice Functions

For each of the following graphs, identify the x-intercepts, y-intercepts, the intervals of increasing/decreasing/constant, and determine the domain and range. Assume arrows on ends if no open/closed circle.

1. x-int. ______  increasing ______________
   y-int. ______  decreasing ______________
   constant ______________
   Domain ______________
   Range ______________

2. x-int. ______  increasing ______________
   y-int. ______  decreasing ______________
   constant ______________
   Domain ______________
   Range ______________

3. x-int. ______  increasing ______________
   y-int. ______  decreasing ______________
   constant ______________
   Domain ______________
   Range ______________
4. x- int. 
  y- int. 
  increasing 
  decreasing 
  constant 
  Domain 
  Range 
  Where is f(x) > 0? 

5. x- int. 
  y- int. 
  increasing 
  decreasing 
  constant 
  Domain 
  Range 
  Where is f(x) < -2? 

6. x- int. 
  y- int. 
  increasing 
  decreasing 
  constant 
  Domain 
  Range