Mat 011 Agenda Day 9   May 31, 2006

Return Quiz

Interpreting Graphs, Lecture 14
Graphing Lines, Lecture 15
Introduction to Slope, Lecture 16

Worksheet

Homework
Topics:  15, 16 and 17
Intercepts:

Graph: \( y = 0.2x + 70 \)

Let \( x = 0 \)

\[
\begin{align*}
  y &= 0.2(0) + 70 \\
  &= 70 \\
\end{align*}
\]

Let \( y = 0 \)

\[
\begin{align*}
  0 &= 0.2x + 70 \\
  -70 &= 0.2x \\
  \frac{-70}{0.2} &= x \\
  -350 &= x \\
\end{align*}
\]
\[ y = 0.2x + 70 \]

\[ y = 0.2(10) + 70 \]
• Given a graph, determine zeros of a graph
• Given a graph, determine the critical regions of a graph
• Graph a line by plotting two points
The graph shows the temperature during a day in Chicago. What was the temperature at noon?
The graph shows the temperature during a day in Chicago. What was the temperature at noon?

(12, 7°)
The graph shows the temperature during a day in Chicago. When was the temperature 0°?
The graph shows the temperature during a day in Chicago.
What was the high temperature for the day?
When was the high temperature?
The graph shows the temperature during a day in Chicago. What was the **low** temperature for the day? When was the **low** temperature?
The graph shows the temperature during a day in Chicago. When was the temperature rising?
The graphs below show the profit for two companies, PA and HL. How many calculators does HL have to sell to break even? How many does PA have to sell to break even?
A repair shop charges 30 plus $15 per hour.

Write the equation that relates cost and hours.

\[ C = 15h + 30 \]
A repair shop charges 30 plus $15 per hour.

\[ C = 15h + 30 \]

<table>
<thead>
<tr>
<th>h</th>
<th>( C = 15h + 30 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>( C = 15(0) + 30 = 30 )</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>h</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
C = 15h + 30
\[ y = 3x - 4 \]

\[ y = 3(1) - 4 = 3 - 4 = -1 \]

\[ 0 = 3x - 4 \]

\[ 4 = 3x \]

\[ \frac{4}{3} = x \]
The equation $y = 3x - 4$ is graphed, showing the points $(0, -4)$ and $(3, 5)$. The line crosses the y-axis at $y = -4$ and the x-axis at $x = 4/3$. The graph is labeled Lecture 14.
Graph by plotting points: \(6x - 4y = 18\)

Let \(x = 0\):

\[6(0) - 4y = 18\]
\[-4y = 18\]
\[y = \frac{-18}{-4} = \frac{9}{2} = 4.5\]

Let \(y = 0\):

\[6x = 18\]
\[x = \frac{18}{6} = 3\]

\[0 \quad -4.5\]
\[3 \quad 0\]
Graph by plotting points: \[6x - 4y = 18\]
Graph by plotting points: 

\[ y = \frac{-1}{2}x + 5 \]

Points: (0, 5), (2, 4), (4, 3)

Table:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>
Graph by plotting points: $6x + 5y = 35$

$x | y$
$0 | 7$
$5.8 | 0$

$5y = 35$
$y = 7$

$6x + 0 = 35$
$6x = 35$
$x = 5.8$
Graph using intercepts

$3x + 2y = 6$

Let $x = 0$

$0 + 2y = 6$

$\frac{2y}{2} = \frac{6}{2}$

$y = 3$

Let $y = 0$

$3x + 0 = 6$

$3x = 6$

$x = 2$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
The equation $3x + 2y = 6$ is graphed on a coordinate plane. The table includes the points $(0, 3)$ and $(2, 0)$, which are plotted on the graph. The line passes through these points, indicating the solution to the equation.
Graph $y = 4$ - Constant

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Graph $x = -2$
• Graph a line by plotting points
• Graph a line by plotting the intercepts
• Determine Slope
• Calculate the Average Rate of Change
• Calculate the Percent Change
Terms used everyday

Roof

Toilet

Road

Ramp

Taxes
### Terms used everyday

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>Pitch</td>
</tr>
<tr>
<td>Toilet</td>
<td>Gallons per flush</td>
</tr>
<tr>
<td>Road</td>
<td>grade of the road</td>
</tr>
<tr>
<td>Ramp</td>
<td>inch per foot</td>
</tr>
<tr>
<td>Taxes</td>
<td>1 mil</td>
</tr>
</tbody>
</table>
Betsy Ross House
### Slope

**Slope is rise over run**

This chart gives the year and the average time spent by women in a supermarket.

<table>
<thead>
<tr>
<th>Year</th>
<th>Time Spent in Supermarket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>32</td>
</tr>
<tr>
<td>1996</td>
<td>78.3</td>
</tr>
</tbody>
</table>

\[ m = \frac{\text{rise}}{\text{run}} \]

\[ m = \frac{78.3 - 32}{1996 - 1991} = \frac{46.3}{5} = 9.26 \text{ time/year} \]

\[ m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} \]
### Slope – Average Rate of Change

<table>
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<td>78.3</td>
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</tbody>
</table>

\[
slope = \frac{\text{rise}}{\text{run}}
\]
Slope – Average Rate of Change

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<tr>
<td>1996</td>
<td>78.3</td>
</tr>
</tbody>
</table>

\[
\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{78.3 - 32}{1996 - 1991} = \frac{46.2}{5} = 9.3 \text{ hours/year}
\]
Slope – Percent Change

Percent Change = \left( \frac{\text{New} - \text{Old}}{\text{Old}} \right) \cdot 100

\[
\frac{78.3 - 32}{32} = \frac{46.3}{32} = 1.46
\]

146%
Slope – Percent Change

<table>
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<tbody>
<tr>
<td>1991</td>
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</tr>
<tr>
<td>1996</td>
<td>78.3</td>
</tr>
</tbody>
</table>

Percent Change = \( \left( \frac{\text{New} - \text{Old}}{\text{Old}} \right) \cdot 100 \)

\[
\text{Percent Change} = \left( \frac{78.3 - 32}{32} \right) \cdot 100
\]

\[
\text{Percent Change} = \left( \frac{46.3}{32} \right) \cdot 100
\]

\[
\text{Percent Change} = (1.447) \cdot 100
\]

\[
\text{Percent Change} = 144.7\%
\]
SLOPE

You have to RISE before you can RUN!

TRACK MEET
TODAY
http://faculty.mc3.edu/whunter/excel/Algebra/Intro_to_Slope_Car_Rental.xls
GRAPHS OF THE FORM $Y = mX + b$
C = 0.61 M + 21.95

<table>
<thead>
<tr>
<th>Miles</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>28.05</td>
</tr>
<tr>
<td>30</td>
<td>40.25</td>
</tr>
</tbody>
</table>

RATIO

\[
\frac{40.25}{30} - \frac{28.05}{10} = \frac{12.2}{20} = 0
\]
\[ C = 0.41 \times M + 21.95 \]

<table>
<thead>
<tr>
<th>Miles</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>26.05</td>
</tr>
<tr>
<td>30</td>
<td>34.25</td>
</tr>
</tbody>
</table>

\[ \text{RATIO} = \frac{34.25 - 26.05}{30 - 10} = \frac{8.2}{20} = 0.41 \]
GRAPHS OF THE FORM $Y = mx + b$

$Y = 5x - 5$
Slope

Slope is rise over run.

\[ m = \frac{\text{Change in } Y}{\text{Change in } X} \]

\[ m = \frac{\text{Change in } Y}{\text{Change in } X} = \frac{Y_1 - Y_0}{X_1 - X_0} \]
Slope

Find the Slope of the line that passes through (6, -2) and (5, 7).

\[
m = \frac{\text{Change in } Y}{\text{Change in } X} = \frac{Y_1 - Y_0}{X_1 - X_0}
\]

\[
m = \frac{Y_1 - Y_0}{X_1 - X_0} = \frac{7 - (-2)}{5 - 6} = \frac{9}{-1} = -9
\]

\[
m = \frac{Y_1 - Y_0}{X_1 - X_0} = \frac{9}{-1} = -9
\]
Plot the points and verify the slope of -9

(6, -2)
(5, 7)
Slope

Find the Slope of the line that passes through \((8, 2)\) and \((4, -12)\).

\[
m = \frac{\text{Change in } Y}{\text{Change in } X} = \frac{Y_1 - Y_0}{X_1 - X_0}
\]

\[
m = \frac{Y_1 - Y_0}{X_1 - X_0} = \frac{-12 - 2}{4 - 8} = \frac{-14}{-4} = \frac{7}{2}
\]

\[
m = \frac{Y_1 - Y_0}{X_1 - X_0} = \frac{7}{2} = 3.5
\]
Plot the points and verify the slope of 3.5

(8, 2)
(4, -12)
Slope

Find the Slope of the line that passes through (2, 4) and (2, -5).

\[ m = \frac{\text{Change in } Y}{\text{Change in } X} = \frac{Y_1 - Y_0}{X_1 - X_0} \]

\[ m = \frac{-5 - 4}{2 - 2} = \frac{-9}{0} = \text{undefined} \]

\[ m = \frac{Y_1 - Y_0}{X_1 - X_0} = \text{undefined} \]
Plot the points and verify the slope.

(2, 4)
(2, -5)
\[ Y = mx + b \]

\( m = \text{slope}; \ b = \text{y-intercept} \)

<table>
<thead>
<tr>
<th>( Y = mx + b )</th>
<th>( y = \frac{-3}{4} x - 5 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( m )</td>
<td></td>
</tr>
<tr>
<td>( b )</td>
<td></td>
</tr>
</tbody>
</table>
$y = \frac{-3}{4}x - 5$
$y = \frac{-3}{4}x - 5$

Points:
- $(4, -8)$
- $(0, -5)$
\[ Y = mx + b \]
\[ m = \text{slope}; \ b = \text{y-intercept} \]

<table>
<thead>
<tr>
<th>[ Y = mx + b ]</th>
<th>[ y = 4x + 5 ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ m ]</td>
<td></td>
</tr>
<tr>
<td>[ b ]</td>
<td></td>
</tr>
</tbody>
</table>
Solve for \( y \) in terms of \( x \)

\[ 3x + 2y = 6 \]

\[ 3x + 2y = 6 \]

\[ 2y = 6 - 3x \quad \text{Subtract} \ 3x \text{ from both sides} \]

\[ y = \frac{6 - 3x}{2} \quad \text{Divide both sides by} \ 2 \]

\[ y = \frac{-3}{2} x + 3 \quad \text{Write in} \ y = mx + b \text{ form} \]
$3x + 2y = 6$

$y = \frac{-3}{2}x + 3$