Math 125
Fall 2017
Lecture 1

Math 125 → 8 weeks
    → Math 227 (Oct. 23 - Dec. 20)

Rahim Faradineh
323-260-8129
r.faradineh@gmail.com

M- Th 6:00-8:35 AM 8 weeks
All materials including textbook are available on www.my.mathclasses.com
Ch. 3  Graphing linear equations in two Variables

Rectangular Coordinate System

QII

Origin (0,0)

QI

(3,5)

Points

(x, y)

ordered pair

Plot (3, 5)

QIII

(-2, -1)

Plot (-2, -4)

QIV

Given A(-5,2), B(3,-4), Draw \overline{AB}

\[ m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - (-4)}{-5 - 3} = \frac{6}{-8} = \frac{-3}{4} \]

"line segment AB"

Slope

\[ m = \frac{y_1 - y_2}{x_1 - x_2} \]

M\left(\frac{-5+3}{2}, \frac{2+(-4)}{2}\right) = (-1, -1) \]

Midpoint

\[ M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) \]

Distance

\[ d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} = \sqrt{(-8)^2 + 6^2} = \sqrt{100} = 10 \]
A(-6,-4), B(0,6)

1. Draw $\overline{AB}$
   \[ m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-4)}{0 - (-6)} = \frac{10}{6} = \frac{5}{3} \]

2. Find slope
   \[ m = \frac{\text{Rise}}{\text{Run}} = \frac{5}{3} \]

3. Find midpoint
   \[ m = \left( \frac{-6 + 0}{2}, \frac{-4 + 6}{2} \right) = M(-3,1) \]

4. Find distance
   \[ d = \sqrt{(-6-0)^2 + (-4-6)^2} = \sqrt{36 + 100} = \sqrt{136} \approx 11.6 \]

Eqn of a line

1) Vertical line $x = a$
   \[ x = 2, \ x = -4 \]

2) Horizontal line $y = b$
   \[ y = 4, \ y = -3 \]

3) Slant line
   Standard $Ax + By = C$
   \[ 2x - 3y = -6 \]
   Slope-Int $y = mx + b$
   \[ y = \frac{-y}{5}x + 8 \]
   Point-Slope $y - y_1 = m(x - x_1)$
   \[ y + 3 = \frac{1}{2}(x - 4) \]
Graph \( x = 2 \) \& \( y = -3 \)

- **Vertical line**
  \( x = 2 \)
  No slope or undefined slope
- **Horizontal line**
  \( y = -3 \)
  Zero slope \( m = 0 \)

Graph \( 3x - 4y = 12 \) by intercept method

\[
\begin{array}{c|c}
 x & y \\
 \hline
 0 & -3 \\
 4 & 0 \\
\end{array}
\]

- \( 3(0) - 4y = 12 \)
- \(-4y = 12 \)
- \( y = -3 \)
- \( 3x - 4(0) = 12 \)
- \( 3x = 12 \)
- \( x = 4 \)

\( m = \frac{3}{4} \)
Graph $5x + 4y = -20$ by intercept method. Find its slope & show rise & run on the graph.

<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>0</td>
</tr>
</tbody>
</table>

$m = \frac{-5}{4}$

Graph $y = \frac{2}{5}x - 2$

$m = \frac{2}{5}$

Slope-Int Form: $y = mx + b$

$y$-Int $(0, 2)$
Graph \( y = \frac{3}{4}x + 2 \) and \( y = \frac{4}{3}x - 6 \) when working with slant lines.

\[ m_1 = m_2 \iff \text{Parallel} \]

\[ m_1 \cdot m_2 = -1 \iff \text{Perpendicular} \]

\[
\frac{4}{3} \cdot \frac{-3}{4} = \frac{-12}{12} = -1
\]

Graph \( 2x - 5y = -10 \) and \( y = \frac{2}{5}x - 4 \).

“Use Intercept method” “Use slope-Int method”

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>-5</td>
<td>0</td>
</tr>
</tbody>
</table>

Same slope \( m_1 = m_2 \iff \text{Parallel lines} \)
Graph \( x = -3 \), \( y = 2 \), and \( y = \frac{-3}{5} x + 1 \). Shade the region which is bounded by all three graphs.

Point-Slope formula

\[
y - y_1 = m(x - x_1)
\]

\[
y - 2 = \frac{3}{4}(x - 1)
\]

Point \((x_1, y_1) = (1, 2)\)

Slope \(m = \frac{3}{4}\)
\[ y - 4 = \frac{-2}{3} (x + 5) \]
\[ y - y_1 = m (x - x_1) \]
Point \((x_1, y_1) = (-5, 4)\)
Slope \(m = \frac{-2}{3}\)

Graph \(y + 2 = \frac{3}{5} (x - 1)\), discuss increasing, decreasing.
\[ y - y_1 = m (x - x_1) \]
Point \((1, -2)\)
Slope \(m = \frac{3}{5} > 0\) Increasing
\[
A(3, -2), B(0, -2), C(3, 5), D(1, 4)
\]

Find slope for line:

1) \(\overrightarrow{AB}\)
   \[
   m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - (-2)}{3 - 0} = \frac{0}{3} = 0
   \]
   \(\overrightarrow{AB}\) horizontal line

2) \(\overrightarrow{AC}\)
   \[
   m = \frac{-2 - 5}{3 - 3} = \frac{-7}{0}
   \]
   undefined NO Slope

3) \(\overrightarrow{AD}\)
   \[
   m = \frac{2 - (-4)}{3 - 1} = \frac{6}{2} = 3
   \]
   Slant line

\(\overrightarrow{AC}\) Vertical Increasing

Some Algebra review:

1) Evaluate \(b^2 - 4ac\) for \(a = 2, b = -4, c = -3\).

   \[
   b^2 - 4ac = (-4)^2 - 4(2)(-3) = 16 + 24 = \boxed{40}
   \]

2) Solve \(\frac{2}{3}x - \frac{1}{2} = \frac{5}{6}\)

   LCD = 6
   \[
   4x - 3 = 5
   \]
   Solution Set \(\{2\}\)
3) Solve and graph

\[ 2x - 8 \leq 4x + 10 \]

\[ 2x - 4x < 10 + 8 \]

\[ -2x \leq 18 \]

Divide by -2

\[ x \geq -9 \]

---

Graph the solution

\[ -5 \leq 2x - 3 < 13 \]

Add 3

\[ -5 + 3 \leq 2x - 3 + 3 < 13 + 3 \]

\[ -2 \leq 2x < 16 \]

Divide by 2

\[ -1 \leq x < 8 \]
Simplify
\[
\frac{(x^5)^2 \cdot x^4}{x^3} \cdot x^4 = (x^m)^n = x^{m \cdot n}
\]
\[
x^{m \cdot n} = x^{m+n}
\]
\[
\frac{x^m}{x^3} = x^{m-n}
\]
\[
\frac{14}{x^3} = \frac{11}{x}
\]
\[
(\frac{x^2}{x^3} \cdot (x^3)^4}{x^{-24}} = \frac{x^{12}}{x^{-24}} = \frac{x^{24}}{x^{-24}} = x^{48}
\]

Find an expression in simplest form for the perimeter and area of the shape below.

**Hint**

\[
P = 2L + 2W, \ A = LW
\]
\[
P = 2(3x+2) + 2(2x-1)
\]
\[
= 6x + 4 + 4x - 2
\]
\[
P = 10x + 2
\]
\[
A = (3x+2)(2x-1)
\]
\[
= 6x^2 - 3x + 4x - 2
\]
\[
A = 6x^2 + x - 2
\]
Find an expression in simplest form for the volume of shape below.

\[ V = LWH \]

\[ V = (3x+2)(3x-2) \cdot 4x \]

\[ = 4x (3x+2)(3x-2) \]

\[ = 4x (9x^2 - 4) \]

\[ V = 36x^3 - 16x \]

1) Decide if this is a right class for you.
2) Print Section 1, and work on it.
3) Quit 1 → Tomorrow → 6:00 AM