Math 125
Fall 2017
Lecture 1

Math 125
M- Th
9:00 -11:35
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www.my.mathclasses.com

You must have access to Canvas.
Ch. 3  Intro to graphing

Rectangular Coordinate System

Points → ordered pairs $(x, y)$

Plot $(2,5)$

Plot $(0, -3)$

when you connect $A(x_1, y_1)$ to $B(x_2, y_2)$, you get line segment $AB$

Draw $\overline{AB}$ where $A(-3, 2)$ & $B(4, 0)$

Line Segment

Draw $\overline{AB}$ where $A(-4, -6)$ & $B(0, 0)$
Distance between two points

\[ d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2} \]

ex: \( A(-6,2) \), \( B(0,10) \), find the distance

\[
\begin{align*}
d &= \sqrt{(-6-0)^2 + (2-10)^2} \\
   &= \sqrt{(-6)^2 + (-8)^2} \\
   &= \sqrt{36 + 64} \\
   &= \sqrt{100} = 10
\end{align*}
\]

Your turn: \( A(7,3) \), \( B(7,5) \)

Find distance from \( A \) to \( B \).

\[
\begin{align*}
d &= \sqrt{(7-7)^2 + (3-5)^2} \\
   &= \sqrt{0^2 + (-2)^2} \\
   &= \sqrt{0 + 4} = \sqrt{4} = 2
\end{align*}
\]

Midpoint between \( A(x_1, y_1) \) and \( B(x_2, y_2) \)

is \( M \left( \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) \)
Ex.  \( A(-8, 6) , B(4, 0) \)

Midpoint \( M \left( \frac{-8+4}{2}, \frac{6+0}{2} \right) = M(-2, 3) \)

Your turn: \( A(7, -3) , B(1, 9) \)

Find the midpoint \( M \left( \frac{7+1}{2}, \frac{-3+9}{2} \right) \)

\( M \left( 4, 3 \right) \)

\( A(-5, -3) , B(5, 7) \)

1) Draw \( \overline{AB} \)

2) Find \( d \)

3) Find \( M \)

\[ d = \sqrt{(-5-5)^2 + (-3-7)^2} = \sqrt{(10)^2 + (10)^2} = \sqrt{200} \]

\[ M \left( \frac{-5+5}{2}, \frac{-3+7}{2} \right) = M \left( 0, 2 \right) \approx 14.142 \]

\( \approx 14.1 \)
A \((-2,5), B(4,0)\)

1) Draw \(AB\)

2) Show rise & run of its slope

3) Find \(m\).

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

\[
m = \frac{5 - 0}{4 - (-2)} = \frac{5}{6} = \frac{-5}{6}
\]
Draw two lines with slopes $\frac{3}{2}$ and $-\frac{2}{3}$ that both contain $(-5, 4)$.

These two lines are **Perpendicular** because the product of their slopes is $-1$.

Draw two lines with slope $\frac{3}{5}$, one contains $(0, 3)$, other one contains $(4, 0)$.

These two lines are **Parallel** because they have the same slope.
Equation of lines

1) Vertical line \( x=a \) \( x=4 \)

2) Horizontal line \( y=b \) \( y=-3 \)

3) Slant line \( Ax+By=C \) \( x+4y=-8 \)

\[ y = mx + b \]

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

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

Graph \( x=3 \) \& \( y=-2 \) in the same coordinate system.
Graph $x = -4, y = -2 = 0$, clearly mark their intersection point.

$y = -2$

Vertical lines have no slope or undefined slope.

Horizontal lines have Zero Slope ($m = 0$).

$Ax + By = C$

$2x - 3y = 12$

Use Intercept method to graph

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-4</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

$Standard form$

$m = \frac{4}{6} = \frac{2}{3}$

$(0, -4)$

$(6, 0)$
Graph \( x - 2y = -6 \)
\[
\begin{array}{c|c}
 x & y \\
\hline
 0 & 3 \\
-6 & 0
\end{array}
\]

Graph \( 2x + 5y = -10 \)
\[
\begin{array}{c|c}
 x & y \\
\hline
 0 & -2 \\
-5 & 0
\end{array}
\]

Slope-Int. Form
\[ y = \text{m}x + b \]
\[ y = \frac{2}{3}x - 2 \]
Y-Int. \( (0, b) \)
Y-Int. \( (0, -2) \), \( m = \frac{2}{3} \)
Slope \( m \)
Graph $y = \frac{4}{3}x + 2 \; \& \; y = \frac{-3}{4}x + 2$

in the same rectangular coordinate system.

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

lines are \( \perp \).

Graph both lines \& shade between them

\[
y = \frac{-2}{5}x + 4 \; \& \; y = \frac{2}{5}x - 4
\]
**Point-Slope Form**

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

**Point** \((x_1, y_1)\)

**Slope** \(m\)

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

**Point** \((4, 3)\)

\[ m = \frac{1}{2} \]

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**Graph**

\[ y + 5 = \frac{2}{3}(x - 2) \]

\((2, -5)\)

\[ m = \frac{-2}{3} \]

**Draw & Shade below**

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Graph \( y - 3 = 2(x + 4) \), shade above.

\( (-4, 3) \)

\( m = \frac{2}{1} \)

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

\( y - 3 = m(x - (-4)) \)