Math 125
Section # 1868
M T Th F
9:00 AM - 12:05 PM

1. www.my.mathclasses.com
2. Short emails: r-faradineh@gmail.com
3. Final exam
   Friday Dec. 16, 2016
4. Something to turn in everyday.
   No late turn in,
   No early turn in.
Points, Lines, and More

Ordered Pair \((x, y)\)

Plot \((-3, 2)\), \((0, -4)\), \((5, 0)\)

Line Segment \(\overline{AB}\)

Line containing \(A\) \& \(B\)

Draw \(\overrightarrow{AB}\) with \(A(-4, -3)\) \& \(B(2, 5)\)

Increasing

Decreasing
midpoint of line segment AB where 
A(x₁, y₁) & B(x₂, y₂)

M \left( \frac{x₁ + x₂}{2}, \frac{y₁ + y₂}{2} \right)

ex: A(0, 6), B(4, -4)

1. Draw \overline{AB}
2. Find & Plot midpoint M.

M \left( \frac{0 + 4}{2}, \frac{6 + (-4)}{2} \right) = M(2, 1)

Distance from A to B where A(x₁, y₁) & B(x₂, y₂):

d = \sqrt{(x₁-x₂)^2 + (y₁-y₂)^2}

ex: A(-5,2), B(1,10), Find d(A, B)

d = \sqrt{(-5 - 1)^2 + (2 - 10)^2} = \sqrt{(-6)^2 + (-8)^2}

= \sqrt{36 + 64} = \sqrt{100} = 10
Given \( A(-5,0), B(5,-8) \)

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

2. Find & plot midpoint \( M \)

3. Find \( d(A,B) \)

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

\[
= \sqrt{(-5 - 5)^2 + (0 - (-8))^2}
= \sqrt{(-10)^2 + (8)^2}
= \sqrt{164}
\approx 12.8
\]

Slope of a line \( \overline{AB} \) where \( A(x_1,y_1) \) & \( B(x_2,y_2) \):

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

\[
\text{Rise} \quad \text{Run}
\]

Always reduce, stay away from mixed #. Stick with integers.
Draw $\overline{AB}$ where $A(-3,4)$ and $B(5,-1)$

$m = \frac{4 - (-1)}{-3 - 5} = \frac{4 + 1}{-3 - 5} = \frac{5}{-8} = \frac{-5}{8}$

$A(-5,-2), B(0,4)$

1. Draw $\overline{AB}$, show Rise & Run of slope

2. Find & Plot $M$

3. Find $d(A,B)$

4. Compute Slope $m$

$m = \frac{-2 - 4}{-5 - 0} = \frac{-6}{-5} = \frac{6}{5}$

$m = \frac{6}{5}$

$M\left(-\frac{5+0}{2}, \frac{-2+4}{2}\right) = M(-2.5,1)$
⑤ \[ d(A, M) = \sqrt{(-5 - 2.5)^2 + (-2 - 1)^2} \]
\[ = \sqrt{(-5 + 2.5)^2 + (-3)^2} = \sqrt{(-2.5)^2 + 9} \]
\[ = \sqrt{15.25} \approx 3.905 \]

⑥ \[ d(B, M) = \sqrt{(0 - 2.5)^2 + (4 - 1)^2} \]
\[ = \sqrt{(2.5)^2 + (3)^2} = \sqrt{6.25 + 9} = \sqrt{15.25} \approx 3.905 \]

Types of lines:
① Vertical \[ x = a \]
\[ x = -4 \]

② Horizontal \[ y = b \]
\[ y = 5 \]

③ Slant \[ Ax + By = C \]
\[ x + 3y = 6 \] Standard
\[ y = mx + b \]
\[ y = \frac{2}{3}x - 4 \] Slope-Int
\[ y - y_1 = m(x - x_1) \]
\[ y - 2 = 3(x + 1) \] Point-Slope
Graph \( x = 3 \) \& \( y = -2 \) in the same coordinate system.

Graph \( x = -4 \), \( y = 2 \), and \( 2x + 3y = -6 \) in the same coordinate system.

\[
\begin{array}{c|c}
\text{if } x = 0 & \text{if } y = 0 \\
-2 & 0
\end{array}
\]
Draw \( x = -5 \), and shade to the right,
Draw \( y = 3 \), and shade below,
Draw \( x - 3y = 6 \), and shade above.
Now darken the region that is shaded for all three.
\[
\begin{array}{c|c|c}
    x & y & \text{Region} \\
    \hline
    0 & -2 & \text{Shaded} \\
    6 & 0 & \text{Shaded} \\
\end{array}
\]

Graphing lines in slope-int form

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

1. Plot Y-Int \((0, -4)\)
2. From there \( 2 \uparrow \), and 3 \\
3. Draw the line
Graph \( y = \frac{3}{5}x + 3 \)
Mark Y-Int, show rise and run of slope.
\( Y-\text{Int} \) (0, 3)
\( m = \frac{-3}{5} \)

Draw two lines with Y-Int (0, 4) and
Slopes \( \frac{3}{5} \) and \( \frac{-5}{3} \).
Since \( \frac{3}{5} \cdot \frac{-5}{3} = -1 \)
therefore
these two lines are **Perpendicular**.
Draw two lines with slope \( \frac{-2}{5} \) and one contains \((-3,4)\) and other one contains \((0,-4)\).

Since we have same slopes, lines are parallel.

Graph \( y = \frac{1}{2}x + 3 \), shade below.

Graph \( y = -\frac{1}{2}x - 4 \), shade above.

Graph \( x = 4 \), shade to the left.
Graphing Point-Slope Form

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

1. Plot the point \((x_1, y_1)\)
2. From that point, use rise \& run of slope.
3. Now draw the line

Graph \( y - 3 = \frac{4}{3}(x - 4) \)

Graph \( y - 2 = -\frac{3}{4}(x + 4) \)

Point \((-4, 2)\)
Slope \(-\frac{3}{4}\)
Rise -3
Run 4
Shade between \( y + 4 = \frac{3}{5}(x - 2) \) \& \( y - 4 = \frac{3}{5}(x - 2) \)

\( m = \frac{3}{5} \) for both lines

(2, -4) \( \quad \) (2, 4)

Suppose \( y = |x| \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>-2</td>
<td>2</td>
</tr>
</tbody>
</table>

Plot the points & Draw.
Suppose $y = x^2$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
</tr>
</tbody>
</table>

Suppose $y = \sqrt{x}$

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>
\[ 4x + 3y = 9 \quad \text{Standard Form} \quad \longrightarrow \quad y = mx + b \quad \text{Slope-Int Form} \]

\[ \frac{3y}{3} = -\frac{4}{3}x + \frac{9}{3} \quad \Rightarrow \quad y = -\frac{4}{3}x + 3 \]

\[ y + 3 = \frac{1}{2}(x - 4) \quad \text{Point-Slope Form} \quad \longrightarrow \quad y = mx + b \quad \text{Slope-Int Form} \]

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

\[ y + 3 = \frac{1}{2}x - 2 \quad \Rightarrow \quad y = \frac{1}{2}x - 2 - 3 \quad \Rightarrow \quad y = \frac{1}{2}x - 5 \]

Write \( y - 4 = \frac{3}{5}(x - 1) \) in slope-intercept form.

\[ y - 4 = \frac{3}{5}x - \frac{3}{5} \cdot 1 \quad \Rightarrow \quad y = \frac{3}{5}x - \frac{3}{5} + 4 \]

\[ y = \frac{3}{5}x - \frac{3}{5} + \frac{20}{5} \quad \Rightarrow \quad y = \frac{3}{5}x + \frac{17}{5} \]

\[ y = \frac{3}{5}x + \frac{17}{5} \]