1.1 and 1.2

Distance, Midpoint, Graphs

Math 1051 - Precalculus I
Solve $2x^2 - 12x - 4 = 0$ by completing the square.

Exams should be returned in discussion Tuesday.
Suppose we know the sum of two numbers is 6...
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There are several ways to represent this relationship:

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- Equation: \( x + y = 6 \)
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- **Words**
- **Equation:** \( x + y = 6 \)
- **Table**
Suppose we know the sum of two numbers is 6...

There are several ways to represent this relationship:

- Words
- Equation: \(x + y = 6\)
- Table
- Picture
Distance Formula

\[ d(P_1, P_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
Distance Formula

\[ \text{distance between } P_1 \text{ and } P_2 = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
Find all points on the $y$-axis that are 5 units from the point $(4, 4)$
Goal: Find the midpoint of two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$.
Midpoint Formula

Goal: Find the midpoint of two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$.

$$x_{\text{midpoint}} = \frac{x_2 + x_1}{2} \quad y_{\text{midpoint}} = \frac{y_2 + y_1}{2}$$
Goal: Find the midpoint of two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$.

\[
x_{\text{midpoint}} = \frac{x_2 + x_1}{2} \quad y_{\text{midpoint}} = \frac{y_2 + y_1}{2}
\]

This looks like the average of the coordinates of the points.
The midpoint of the line segment from $P_1$ to $P_2$ is $(5, -4)$. If $P_2 = (7, -2)$, what is $P_1$?
A hot air balloon, headed due east at an average speed of 15 miles per hour and at a constant altitude of 100 feet, passes over an intersection.

Find an expression for the distance $d$ (feet) from the balloon to the intersection $t$ seconds later.
Graph $y = x^2 + x - 6$ by plotting points
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x-intercepts are where $y = 0$

y-intercepts are where $x = 0$
Find the $x$ and $y$ intercepts of $x^2 + (y - 2)^2 = 16$
There are three main types of symmetry to look out for in an equation:

- Symmetry about the $x$-axis
- Symmetry about the $y$-axis
- Symmetry about the origin
Symmetry about the x-axis

For every point \((x, y)\) on the graph there is another point \((x, -y)\) on the graph.
Symmetry about the x-axis

For every point \((x, y)\) on the graph there is another point \((x, -y)\) on the graph.

\[ x = y^2 + 5 \]
Symmetry about the y-axis

For every point \((x, y)\) on the graph there is another point \((-x, y)\) on the graph.
Symmetry about the y-axis

For every point \((x, y)\) on the graph there is another point \((-x, y)\) on the graph.

\[x^2 + (y - 2)^2 = 16\]
Symmetry about the origin

For every point \((x, y)\) on the graph there is another point \((-x, -y)\) on the graph.
Symmetry about the origin

For every point \((x, y)\) on the graph there is another point \((-x, -y)\) on the graph.

\[ y = x^3 \]
x-axis: Replace $y$ with $-y$ and simplify. If you get the original equation you have symmetry about the $x$ axis.
How to test for symmetries

- **x-axis**: Replace $y$ with $-y$ and simplify. If you get the original equation you have symmetry about the $x$ axis.
- **y-axis**: Replace $x$ with $-x$ and simplify. If you get the original equation you have symmetry about the $y$ axis.
How to test for symmetries

- **x-axis**: Replace \( y \) with \(-y\) and simplify. If you get the original equation you have symmetry about the \( x \) axis.
- **y-axis**: Replace \( x \) with \(-x\) and simplify. If you get the original equation you have symmetry about the \( y \) axis.
- **origin**: Replace \( x \) with \(-x\) and \( y \) with \(-y\) and simplify. If you get the original equation you have symmetry about the origin.
\[ y = \sqrt[5]{x} \]
\[ y = \sqrt[5]{x} \]
\[ y = x^4 - 1 \]
$y = x^4 - 1$
\[ y = \frac{x^2 - 4}{2x} \]
\[ x^2 + (y - 2)^2 = 16 \]
Read section 1.3 for Wednesday