UNIT 6 LESSONS 1-2

PRECALCULUS A

LESSONS:

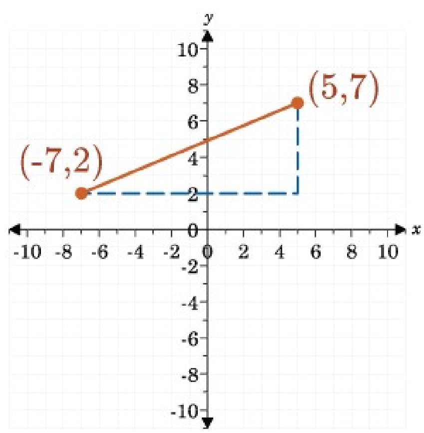
- Analytic Geometry
- Introduction to Conic Sections

ANALYTIC GEOMETRY

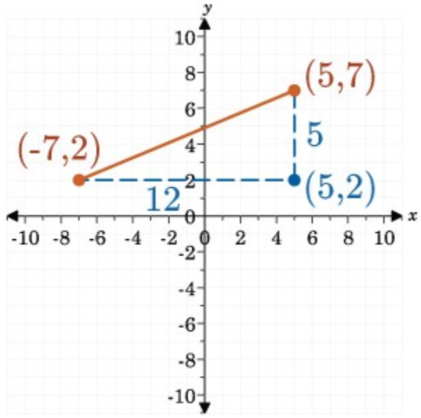
- the study of geometric figures using the coordinate plane
- and using algebraic equations to represent geometric shapes

"analyzing shapes on a graph with algebra"

Let's start with analyzing the length of simple line segments.

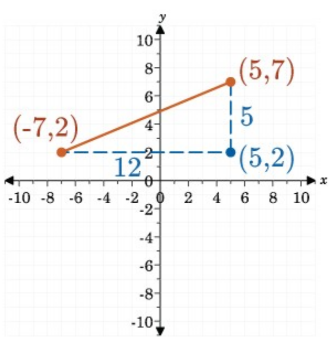


To get from one endpoint to the next, it shifts both horizontally and vertically.
We can count how far for each shift.



You know what comes next for finding the length of the first segment . . .

The Pythagorean Theorem!



$$a^2 + b^2 = c^2$$
$$12^2 + 5^2 = c^2$$
$$144 + 25 = c^2$$
$$169 = c^2$$
$$13 = c$$

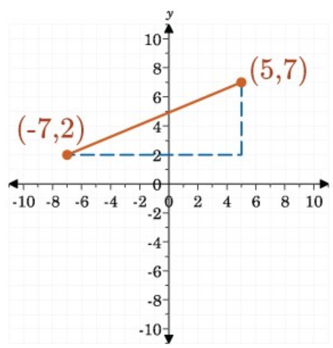
So, yes, this is taking us to the Distance Formula!

$$a^2+b^2=c^2$$
$$12^2+5^2=c^2$$
$$144+25=c^2$$
$$169=c^2$$
$$13=c$$

$$a^2+b^2=c^2$$
$$(x_2-x_1)^2+(y_2-y_1)^2=c^2$$
$$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}=c$$

Next analysis is the Midpoint!

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



(-1, 9/2)

Your turn . . .

(-5, 3) and (3, -5)
Distance = ?
Midpoint = (?, ?)

Your turn . . .

(-5, 3) and (3, -5)

Distance = $8\sqrt{2}$

Midpoint = (-1, -1)

Do you remember how to simplify a radical??

Do a factor tree, and look for perfect squares.

$\sqrt{25}$ $\sqrt{125}$ $\sqrt{60}$

Do you remember how to simplify a radical??

Do a factor tree, and look for perfect squares.

$\sqrt{25}$	$\sqrt{125}$	$\sqrt{60}$
$\sqrt{5*5}$	$\sqrt{5*5*5}$	$\sqrt{2*2*3*5}$

Do you remember how to simplify a radical??

Do a factor tree, and look for perfect squares.

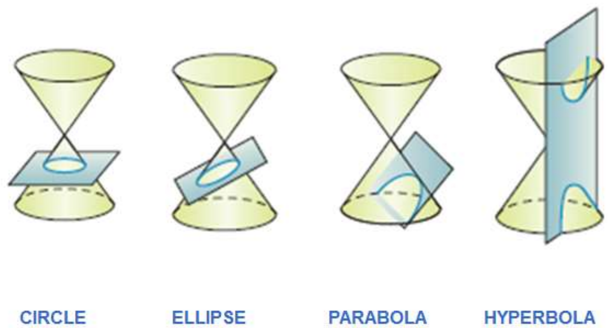
$\sqrt{25}$	$\sqrt{125}$	$\sqrt{60}$
$\sqrt{5*5}$	$\sqrt{5*5*5}$	$\sqrt{2*2*3*5}$
5	$5\sqrt{5}$	$2\sqrt{15}$

Remember, don't give a decimal answer unless the question asks for it.

An improper fraction or a simplified radical is the exact amount.

Rounding off a decimal is an approximate answer.

CONIC SECTIONS



… the intersections of a plane and a double right circular cone.

CONIC SECTIONS

General Equation of a Conic Section

The equation of every conic section can be written in the following form:

$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$, where A, B, C, D, E, and F are real numbers.

… This format covers all four conic section types.

… But how to tell which type from this format?

CONIC SECTIONS

General Equation of a Conic Section

The equation of every conic section can be written in the following form:

$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$, where A, B, C, D, E, and F are real numbers.

Identifying a Conic Section from Its General Equation

The discriminant of the equation is $B^2 - 4AC$.

- If $B^2 - 4AC > 0$, the conic is a hyperbola.
- If $B^2 - 4AC = 0$, the conic is a parabola.
- If $B^2 - 4AC < 0$ and $A = C$, the conic is a circle.
- If $B^2 - 4AC < 0$ and $A \neq C$, the conic is an ellipse.

IDENTIFYING CONIC SECTIONS FROM GENERAL FORM

- ✓ First, multiply/distribute/rearrange to get the equation into the general form.
- ✓ Then, identify the numbers in the A, B, & C positions. (Sometimes they can be zero.)
- ✓ Calculate the Discriminant, and check the guidelines for which shape it is.

$$y^2 - 8x - 10y + 1 = 0$$

$$(x+4)^2 + (y-2)^2 = 3$$

IDENTIFYING CONIC SECTIONS FROM GENERAL FORM

$$y^2 - 8x - 10y + 1 = 0$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

IDENTIFYING CONIC SECTIONS FROM GENERAL FORM

$$y^2 - 8x - 10y + 1 = 0$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

$A = 0$, $B = 0$, and $C = 1$

$$B^2 - 4AC$$

$$0^2 - 4(0)(1) = 0$$

Identifying Conic Sections from General Form

$$y^2 - 8x - 10y + 1 = 0$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

$$A = 0, B = 0, \text{ and } C = 1$$

$$B^2 - 4AC$$
$$0^2 - 4(0)(1) = 0$$

PARABOLA

Identifying Conic Sections from General Form

$$(x+4)^2 + (y-2)^2 = 3$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

IDENTIFYING CONIC SECTIONS
FROM GENERAL FORM

$$(x+4)^2+(y-2)^2=3$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

$$(x^2+8x+16)+(y^2-4y+4)=3$$

$$x^2+y^2+8x-4y+17=0$$

IDENTIFYING CONIC SECTIONS
FROM GENERAL FORM

$$(x+4)^2+(y-2)^2=3$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

$$(x^2+8x+16)+(y^2-4y+4)=3$$

$$x^2+y^2+8x-4y+17=0$$

$A = 1$, $B = 0$, and $C = 1$

B^2-4AC

$0^2-4(1)(1)=-4$

IDENTIFYING CONIC SECTIONS FROM GENERAL FORM

$$(x+4)^2+(y-2)^2=3$$

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

$$\left(x^2+8x+16\right)+\left(y^2-4y+4\right)=3$$

$$x^2+y^2+8x-4y+17=0$$

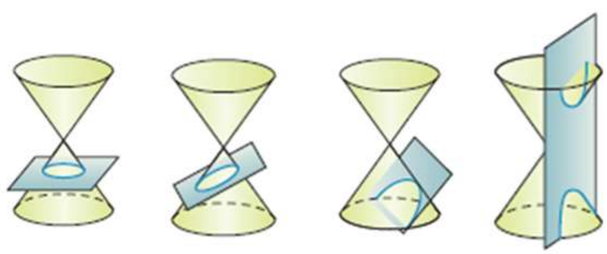
$A = 1$, $B = 0$, and $C = 1$

$B^2 - 4AC$

$0^2 - 4(1)(1) = -4$

CIRCLE

THAT'S IT FOR NOW ON CONIC SECTIONS!



CIRCLE ELLIPSE PARABOLA HYPERBOLA

More Details Coming in the next lessons!

Questions??

Review the Key Terms and Key Concepts documents for this unit.

Look up the topic at khanacademy.org and virtualnerd.com

Check our class website at nca-patterson.weebly.com

*Reserve a time for a call with me at
jpattersonmath.youcanbook.me
We can use the LiveLesson whiteboard
to go over problems together.