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Polar Graph Art
Grades 9-12

Introduction
This activity allows students to explore ways to be creative by designing and making a pieces of art with polar graphs. Students explore polar graphs to make connections between equations, parameters, and graphs. This activity leads to wonderful pieces of art to display around the classroom or school. We love this activty since it shows how mathematicians can think creatively.

Agenda

Activity	Time	Description/Prompt	Materials
Mindset Message	5 min	Play the mindset video.	Mindset video
Explore	20 min	• Share 2-3 pieces of polar graph art. Ask students to share ideas about how the art is mathematical. • Tell students it was made with a polar coordinate graph • Set students up to explore the polar coordinate graph with equations and sliders (https://www.desmos.com/calculator/eo1j7s32wf)	• Polar Graph Art handout • Computer technology with WiFi
Create	20 min	• Create a polar graph art piece • Remove gridlines, axes, and axes labels using graph settings • Share polar graph art piece with teacher	Computer technology with WiFi
Discuss	10 min	Invite students to share patterns, connections, and conjectures: • What do you notice about the connection between the graph, the equation, and the value of the parameters?	
Debrief Mindset Messages	5 min	Debrief the mindset messages for this activity.	

Inspired by Sameer Shah

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Before the Activity

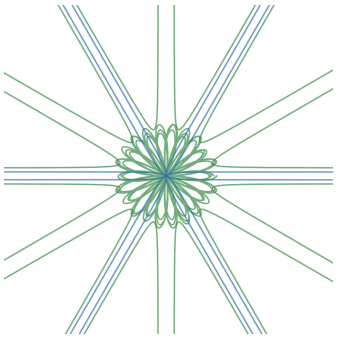
Before doing this activity with students, become familiar with the computer technology. Each student will need their own device. Consider loading the desmos calculator (https://www.desmos.com/calculator/eo1j7s32wf) on each device.

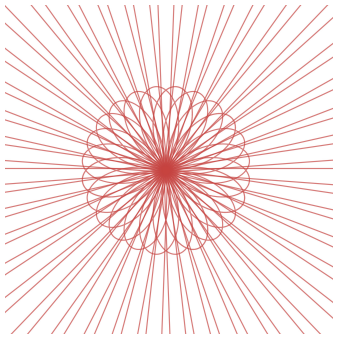
There are three ways students can share what they created; send you a link, export the image to print or email, or download to print or email. Decide how you want students to share their art with you.

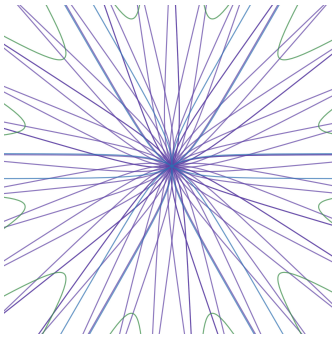
Activity

Watch the mindset video before class. At the beginning of the class share the video and the mindset messages.

Tell students today they are going to create a piece of artwork to be displayed in the classroom or school. Share the polar graph art pieces. Invite students to share ideas about how the art is mathematical. Tell students that in addition to all of what they named as mathematical these images were created using graphs, specifically polar coordinate graphs. Ask if anyone has heard of polar coordinates. Let them know that if they have not it will not get in their way of creating their art pieces.







Set students up to use the desmos calculator to explore polar equations and graphs. Let them know they are going to use an online graph that is populated with polar equations and parameter sliders. Encourage them to explore with the graph and equations by moving the parameter sliders, hiding equations, adding parameters, and more.

Have students open the desmos calculator (https://www.desmos.com/calculator/eo1j7s32wf) and start. As students explore with desmos circulate to answer questions and help students troubleshoot using desmos.

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If students are doing this activity over days have them create an account with desmos so they can save their graph.

When students are done creating their piece of art have them remove the gridlines, axes, and axes numbers in the graph settings. Students can then share with you.

Invite students to share patterns, connections, and conjectures. Ask students to share whatever they like. Ask questions that encourage students to explain and support others to make sense of the ideas shared.

Extension

- How do you think graphing with polar coordinates is related to graphing on the Cartesian plane? What connections do you see?

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Polar Graph Art

Explore the polar coordinate graph with equations and sliders. (https://www.desmos.com/calculator/eo1j7s32wf)

Create your own polar graph art.

Share your art piece with your teacher. Remove gridlines, axes, and axes labels in graph settings before sharing.

Discuss with your group; What do you notice about the connection between the graph, the equation, and the value of the parameters?

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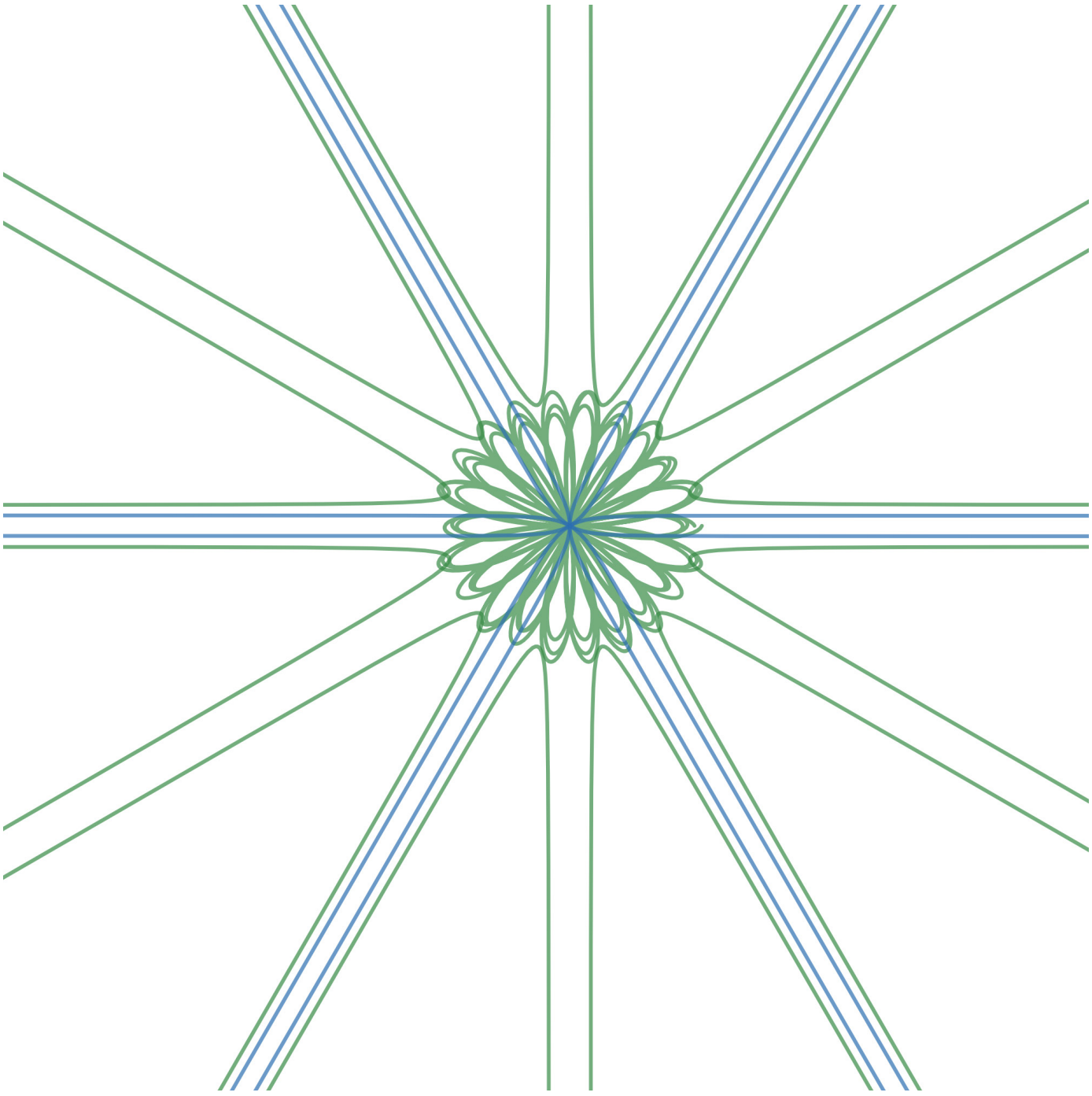

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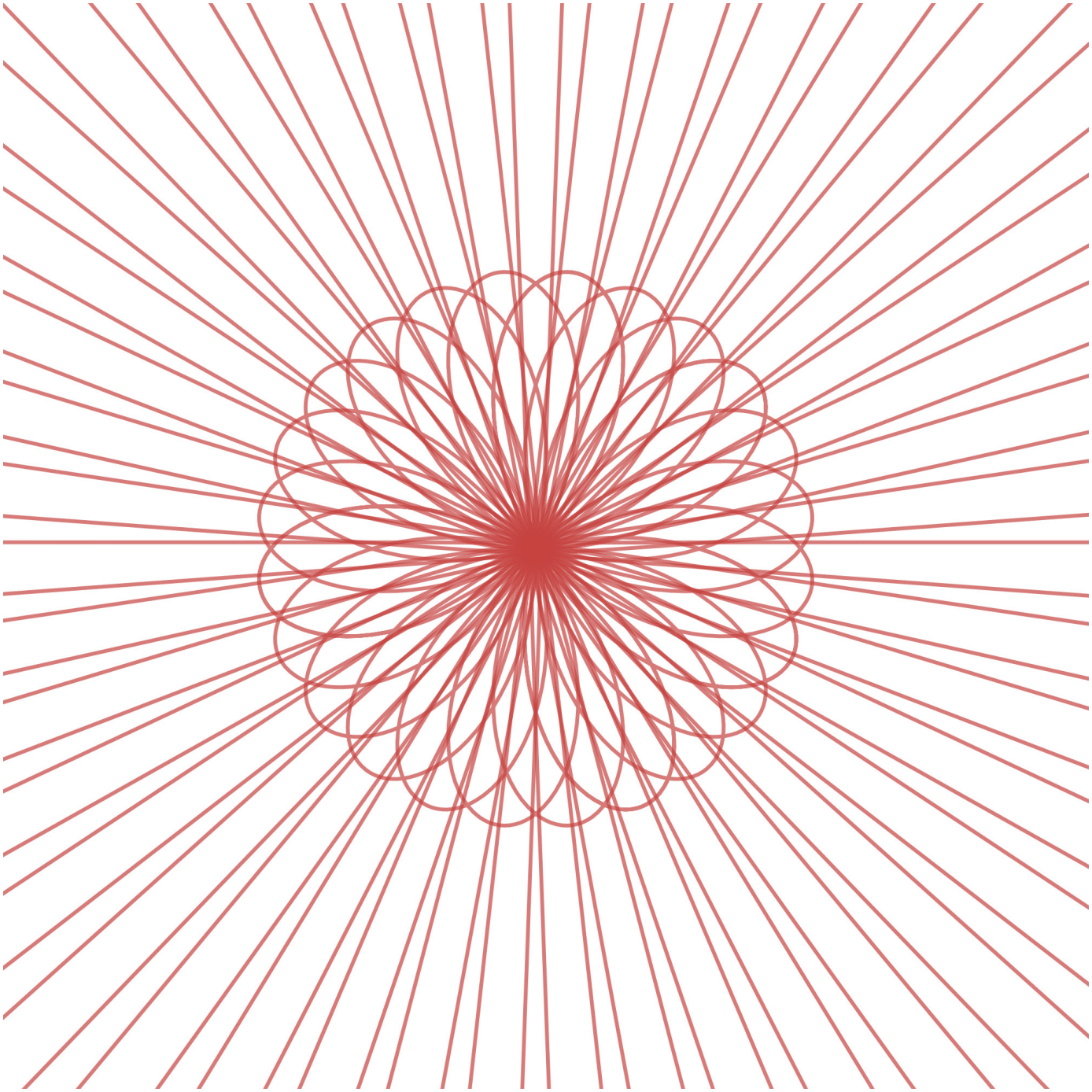

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