Precalculus: Cartoon Project

Introduction

Throughout your mathematics career, you have learned how to graph different types of relations and functions, from the simple line to those more complicated, like conics and exponentials. In this project, you will practice graphing these various relations and functions, gaining a better understanding of how to manipulate equations and exploring how that impacts their corresponding graphs. You will also gain experience utilizing technology as a means of graphing.

Instructions

For this project, you create any cartoon character from an animated show or movie of your choosing. In order to create this character, you may utilize any relations or functions you have learned in the past, but will focus on several specific types. You will use an online graphing calculator (www.desmos.com) in order to create a graph of your character.

To begin your project:

1. Find an image of the character you would like to recreate and get your teacher's approval *before beginning this project*.
2. Create an account with the Desmos online graphing calculator.
3. Add the image of your character to the graph. (You will be graded on how closely your equations match your image.)
4. Write equations to create lines and curves to recreate your character.

You may want to use only a part of a relation in your drawing (e.g., use a semicircle instead of an entire circle), which you can do by either restricting the domain or by using the positive (or negative) part of the equation when rewriting in explicit form. ***It is possible to restrict the range of a relation, but this should only be done if you have already restricted the domain.***

Graph Requirements

- Your goal is for your graph to match the selected image as closely as possible.
- Your character must be primarily located in the 1st and 4th quadrants.
- You must use at least one equation from each of the twelve different relation types listed below to create your cartoon.
  (Note: Other relation types, such as linear and polynomial, may also be used.)
    - Radical
    - Absolute value
    - Rational
    - Sine or cosine
    - Tangent or cotangent
    - Exponential
    - Logarithmic
    - Circle
    - Parabola
    - Ellipse
    - Hyperbola
- In your Desmos file, list the following in order:
    - A copy of your original image
    - Folders for each relation type, listed in the above order.
    - Each equation utilized should be placed in its appropriate folder.
    - The first equation listed in each folder should be the equation used for the Short Responses section.
      (Note: You can shuffle the order of equations; you do not need to utilize the first equation you created for that folder.)
    - Any equations not of the above relation types should be placed in an "Other" folder, listed at the end.
- Print a copy of your graph and color it with markers, crayons, and/or colored pencils.

Short Responses

For each of the following, select an equation from your graph. Ignoring any domain restrictions or explicit rewrites used, indicate the following. Show all work algebraically. Leave any numerical values accurate to at least four decimal places.

- Write the equation of a sine or cosine function. Determine the period for this function.
  Describe the transformations of this function, relative to its parent function.
- Write the equation of a rational function. Find the *x*-intercept(s) and *y*-intercept (if it exists) for this function.
  Describe the asymptotes and holes for this function.
  - o   Note: The rational function selected must have an *x*-intercept and a hole.
- Write the equation of an exponential function. Find the *x*-intercept and *y*-intercept for this function.
  Describe the transformations of this function, relative to its parent function.
  - o   Note: The exponential function selected must have an *x*-intercept.
- Write the equation of a logarithmic function. Find the *x*-intercept and *y*-intercept (if it exists) for this function.
  Describe the transformations of this function, relative to its parent function.
- Write the equation of a parabola in standard form. Describe the vertex, focus, and directrix.
- Write the equation of an ellipse in standard form. Describe the center, vertices, foci, and eccentricity.
- Write the equation of a hyperbola in standard form. Describe the center, vertices, foci, asymptotes, and eccentricity.

Reflection

Write a 1-2 page reflection in **paragraph essay form** that addresses the following prompts:

- Explain why you selected the cartoon character that you chose.
- Discuss what went well and what was difficult about this project.
- Reflect on your usage of Desmos—what was easy and what was difficult.
- Explain how this project helped you to understand the concepts that we have covered so far this semester.
- Describe any changes you would suggest to improve this project in the future.

The reflection must be typed, double-spaced, using Times New Roman or Arial font in size 12, with 1" margins (not 1.25" margins) and no extra spacing. Your name and period number (and only this information, nothing else!) should be inserted at the top-right of the header, not in the body of the actual reflection.

Submission and Grading

An online Google Form will be shared via Jupiter Ed. Use this form to submit a link to your Desmos file.

Staple the colored graph, short responses, and reflection to the back of this packet. Each sheet should be labeled with the student's name and period number.

Each student must submit their project in-person. Projects submitted by a friend, left outside or under the classroom door, or left in the office mailbox will not be accepted.

This project must be submitted to your teacher by **April 17, 2019** (pds 1-3) or **April 18, 2019** (pds 4-7), at the start of your class period. Any projects submitted after this will be marked late; late projects will only be accepted until **Friday, April 26, 2019** by 3:25 p.m. No late projects will be accepted after these dates.

	4 Exceeds	3 Meets	2 Approaching	1 Novice	0 No Understanding
General Learner Outcome (GLO) Self-Directed Learner Score: ____	Project is submitted prior to the due date.	Project is submitted on the due date.	Project is submitted 1-3 school days after the due date.	Project is submitted more than 3 school days after the due date.	Project is not submitted.
General Learner Outcome (GLO) Complex Thinker Score: ____	Short responses and reflection show thorough analysis.	Short responses and reflection show adequate analysis.	Short responses and reflection show some superficial analysis.	Short responses and reflection show very little analysis.	Short responses or reflection is not submitted.
General Learner Outcome (GLO) Quality Producer Score: ____	All components of the project are neat, organized, and of high quality. All required relations are utilized.	All components of the project are neat, organized, and of good quality. All required relations are utilized.	Project is messy, disorganized, or incomplete. The graph resembles the original picture but with significant variations.	Project is messy, disorganized, and incomplete. The graph does not resemble the original picture.	Project is not submitted.
General Learner Outcome (GLO) Effective Communicator Score: ____	Reflection is eloquent, with no grammar/spelling errors.	Reflection is effective, with only a few minor grammar/spelling errors.	Reflection is not always clear, due to grammar/spelling errors.	Reflection is riddled with significant grammar/spelling errors.	Reflection cannot be understood or is nonexistent.
General Learner Outcome (GLO) Effective and Ethical User of Technology Score: ____	Desmos file created and shared according to all instructions. Reflection is printed according to all instructions.	Desmos file created and shared according to most instructions. Reflection is printed according to most instructions.	Desmos file created and shared according to some instructions. Reflection is printed according to some instructions.	Desmos file is not shared according to instructions. Reflection is handwritten.	Desmos file or reflection is not submitted.

All of the above GLO ratings must be a "meets" (3) or "exceeds" (4) in order to qualify for an "exceeds" (4) score on the graded standards that follow. Otherwise, the highest score that you will be eligible for on the graded standards will be a "meets" (3).

	4 Exceeds	3 Meets	2 Approaching	1 Novice	0 No Understanding
A.REI.B* Score: ____	Student correctly solves three equations related to the *x*-intercepts desired.	Student correctly solves two equations related to the *x*-intercepts desired.	Student correctly solves one equation related to the *x*-intercepts desired.	Student correctly sets up one equation related to the *x*-intercepts desired.	Student is unable to show any understanding of solving equations related to the *x*-intercepts desired.
F.IF.C.7.B Score: ____	No errors. At least two (each) radical and absolute value equations accurately contribute to the graph.	No major errors. At least three (total) radical and absolute value equations accurately contribute to the graph.	At least one (each) radical and absolute value equation accurately contributes to the graph.	At least one (each) radical and absolute value equation contributes to the graph, with some error.	Radical and absolute value equations do not contribute to the graph.
F.IF.C.7.D Score: ____	Graph: No errors. At least three rational equations accurately contribute to the graph. Short Response has no errors.	Graph: No major errors. At least two rational equations accurately contribute to the graph. Short Response has no major errors.	Graph: At least one rational equation accurately contributes to the graph. Short Response has some errors.	Graph: At least one rational equation contributes to the graph, with some error. Short Response has many errors.	Graph: Rational equations do not contribute to the graph. Short Response is not submitted.
F.IF.C.7.E Score: ____	Graph: No errors. At least two (each) (co)sine, (co)tangent, exponential, and logarithmic equations accurately contribute to the graph. Short Responses have no errors.	Graph: No major errors. At least six (total) (co)sine, (co)tangent, exponential, and logarithmic equations accurately contribute to the graph. Short Responses have no major errors.	Graph: At least one (each) (co)sine, (co)tangent, exponential, and logarithmic equation accurately contributes to the graph. Short Responses have some errors.	Graph: At least one (each) (co)sine, (co)tangent, exponential, and logarithmic equation contributes to the graph, with some error. Short Responses have many errors.	Graph: (Co)sine, (co)tangent, exponential, and logarithmic equations do not contribute to the graph. Short Responses are not submitted.
F.BF.B.3* Score: ____	Student correctly describes all transformations.	Student correctly describes most transformations.	Student describes transformations with some error.	Student describes transformations with many errors.	Student is unable to describe transformations.
G.GPE.A.1 Score: ____	No errors. At least three circle equations accurately contribute to the graph.	No major errors. At least two circle equations accurately contribute to the graph.	At least one circle equation accurately contributes to the graph.	At least one circle equation contributes to the graph, with some error.	Circle equations do not contribute to the graph.
G.GPE.A.2 Score: ____	Graph: No errors. At least three parabola equations accurately contribute to the graph. Short Response has no errors.	Graph: No major errors. At least two parabola equations accurately contribute to the graph. Short Response has no major errors.	Graph: At least one parabola equation accurately contributes to the graph. Short Response has some errors.	Graph: At least one parabola equation contributes to the graph, with some error. Short Response has many errors.	Graph: Parabola equations do not contribute to the graph. Short Response is not submitted.
G.GPE.A.3 Score: ____	Graph: No errors. At least two (each) ellipse and hyperbola equations accurately contribute to the graph. Short Responses have no errors.	Graph: No major errors. At least three (total) ellipse and hyperbola equations accurately contribute to the graph. Short Responses have no major errors.	Graph: At least one (each) ellipse and hyperbola equation accurately contributes to the graph. Short Responses have some errors.	Graph: At least one (each) ellipse and hyperbola equation contributes to the graph, with some error. Short Responses have many errors.	Graph: Ellipse and hyperbola equations do not contribute to the graph. Short Responses are not submitted.