

# Marvellous Modelling

In this Individual Study Unit, you will be investigating the mathematics of modelling. Since you began high school in grade 9, a large portion of the focus of your mathematics courses has been the use of mathematics to model the "real world". Seeing how mathematics is used by real people doing real work and solving real problems will afford you a greater appreciation of the role mathematics has played, and continues to play, in everyday life.

## THE RULES

This ISU is to be done individually. Plagiarism (from another student or from a researched source) will result in a mark of 'INC' and your work will be forwarded to administration.

## YOUR TASK

You are to model an application using the mathematical tools and concepts you are learning in this course. Your application is a photograph that you will select from the internet. You will build an algebraic model (function) using the website **www.Desmos.com**. Your application (picture) and your algebraic model (function) will be revisited, analyzed, and refined throughout each of the next 3 units of the course.

### **This ISU is to be done in 4 stages:**

Stage 1 - Approval: Select the application (photograph) you are interested in. Stage 1 should be just one page showing the photograph you selected. Select carefully because you will be working on this section for the rest of the project. Hand it in to your teacher for approval. **DO NOT BEGIN WORKING ON THE MODELLING UNTIL YOU HAVE RECEIVED APPROVAL FROM YOUR TEACHER. NO DUPLICATE PHOTOS WILL BE ALLOWED.**

Stage 2 – Functions: While you are learning the concepts of Unit 2, create the function of best fit (linear, quadratic, cubic, square root, absolute value, and reciprocal functions) for different sections of your application. Use transformations as effectively as possible. Remember, this project is about mathematical functions.

Of the following functions, a minimum of 4 types are required to be part of the application. You need to provide evidence of having tested each of the 6 functions against your application. Your evidence is noted through your journal sheets as showing what functions you tried to “fit” to your application.

MCR3U1

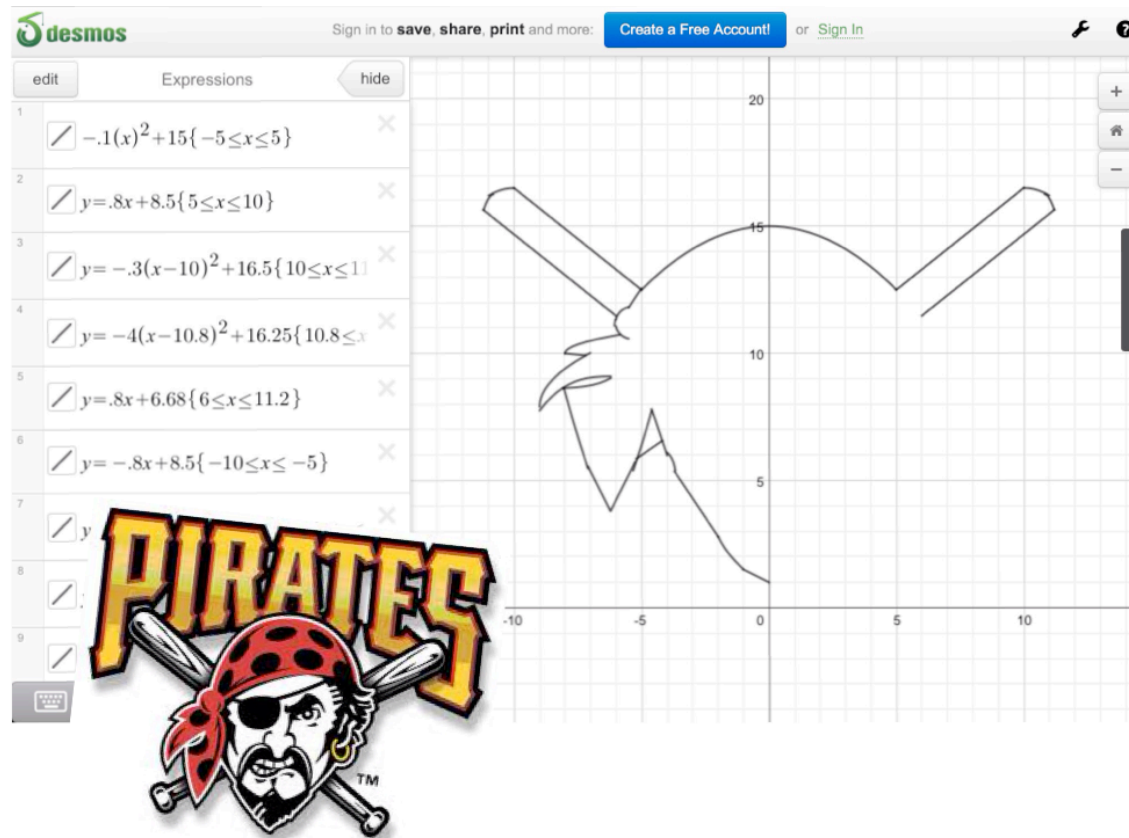
Name

- Linear Functions
- Quadratic Functions
- Cubic Functions
- Square Root Functions
- Absolute Value Functions
- Reciprocal Functions

Analysis is to include restricted domain, transformations, and zeros of the functions.

Also include a 1 – 2 typed paragraph that answers the following: “Pick 1 function from this stage that you are most proud of and clearly explain why you choose this function.”

Stage 2 Example



Stage 3 – Exponential Functions: Repeat the process of stage 2. Now include a minimum of 1 exponential function for your application. Also include a 1 – 2 typed paragraph that answers the following: “Pick 1 function from this stage that you are most proud of and clearly explain why you choose this function.”

Stage 4 – Trigonometric Algebraic Model - analyze which trigonometric function (sine/cosine or tangent) best fits your application. You need to provide evidence of having tested each of the trigonometric functions against your application. Your evidence is noted through your journal sheets as showing what functions you tried to “fit” to your application . However, DO NOT fully analyze all 3. Only provide FULL analysis of the ones you believe provides the best fit for your application. Also include a 1 – 2 typed paragraph that answers the following: “Pick 1 function from this stage that you are most proud of and clearly explain why you choose this function.”

### **DUE DATES**

All due dates must be met for work to be accepted. Since you have the schedule for the semester, there is no excuse for late submissions.

- Stage 1: Friday February 8th
- Stage 2: Friday March 8th
- Stage 3: Friday April 12th
- Stage 4: Friday May 31st

### **ASSESSMENT AND EVALUATION**

Stage 1 will be assessed anecdotally, but not evaluated.

Stages 2 – 4 will be assessed anecdotally, and will be evaluated against the attached rubrics.

The weighting of the evaluations (as a percentage of the ISU mark) are:

- Stage 2 – 10%
- Stage 3 – 20%
- Stage 4 – 70%

**APPLICATION of Concepts**

	Level 1	Level 2	Level 3	Level 4
<b>Demonstration of applying the following concepts:</b> <ul style="list-style-type: none"> <li>- restrictions to domain</li> <li>- zeros</li> <li>- transformation</li> </ul>	Work submitted demonstrates weak understanding of concepts	Work submitted demonstrates some understanding of concepts	Work submitted demonstrates thorough understanding of concepts	Work submitted demonstrates sophisticated understanding of concepts

**Thinking, Inquiry, and Problem Solving**

	Level 1	Level 2	Level 3	Level 4
<b>Creation of the algebraic model</b>	Selects a few appropriate tools to analyze application, but key strategies are incorrect	Selects some appropriate tools to analyze application, but minor strategies are incorrect	Chooses appropriate tools and incorporates these in analysis of application	Choice of tools demonstrates advanced understanding or required extra concepts be learned

**Communication**

	Level 1	Level 2	Level 3	Level 4
<b>Degree of clarity in explanations and justifications</b>	Communication is difficult to understand Little to no explanation of mathematical reasoning of function chosen is provided.	Communication is understandable but not clear Some explanation of mathematical reasoning of function chosen is provided.	Communicates clearly and logically Most explanations of mathematical reasoning of function chosen is provided.	Communicates so that explanations and justifications are thoroughly understandable and logical Every explanation of mathematical reasoning of function chosen is provided.