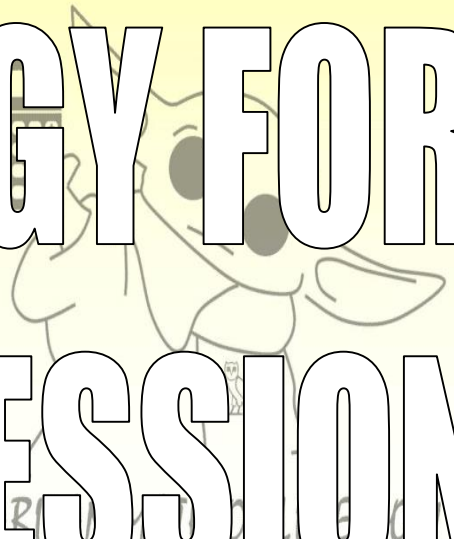
ST. JEAN DE BREBEUF MATHEMATICS

CHAPTER 5.2 (PART 2)

USING TECHNOLOGY FOR QUADRATIC REGRESSION



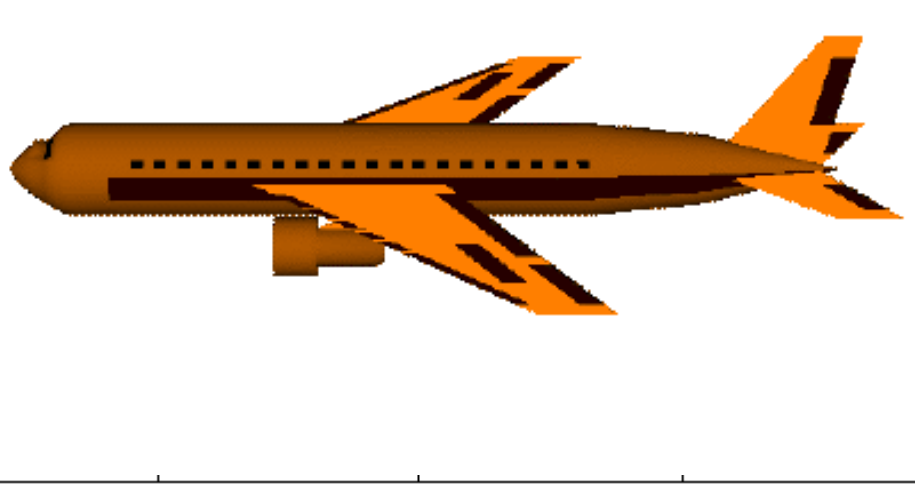
CHAPTER 5.2 (PART 2) USING TECHNOLOGY FOR QUADRATIC REGRESSION

EXAMPLE

Airplane Power Settings

Sammy bought an airplane and wanted to find out the most efficient power setting. He kept the records on the range of the aircraft (in kilometres), starting with a full tank of fuel, for a number of power settings (in RPM or revolutions per minute). The results are shown in the table

Power	Range	1st	2nd
100			
100			
100			
100			



(a) Does the **power setting** column show equal intervals

Yes

*→The power setting **goes <u>up</u> by 100***

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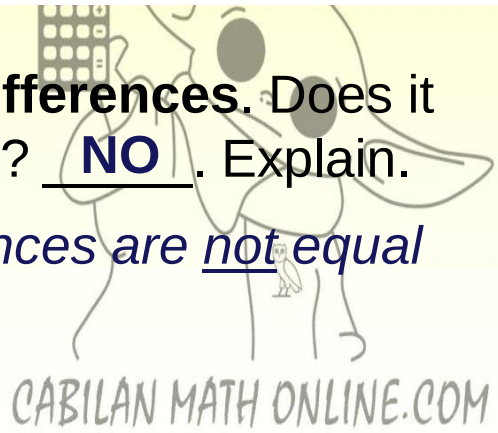
Power setting (RPM)	Range (km)	1st Differences	2nd differences
1500	649		
		695 – 649 = **46**	
1600	695		
		733 – 695 = **38**	
1700	733		
		763 – 733 = **30**	
1800	763		
		785 – 763 = **22**	
1900	785		

(b) Calculate the **1st Differences**. Does it imply a **linear relation**? **NO**. Explain.

The 1st Differences are not equal
→Non-linear



CHAPTER 5.2 (PART 2) USING TECHNOLOGY FOR QUADRATIC REGRESSION

EXAMPLE

Airplane Power Settings

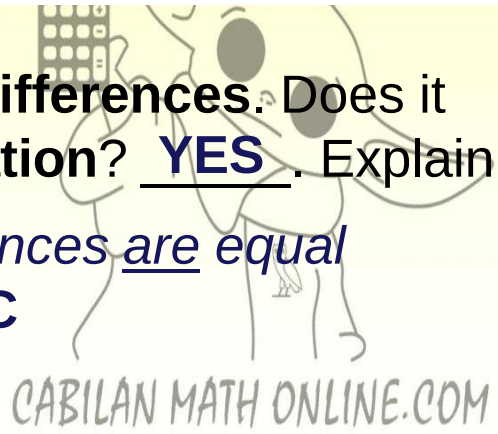
Sammy bought an airplane and wanted to find out the most efficient power setting. He kept the records on the range of the aircraft (in kilometres), starting with a full tank of fuel, for a number of power settings (in RPM or revolutions per minute). The results are shown in the table

Power setting (RPM)	Range (km)	1st Differences	2nd differences
1500	649		
		46	
1600	695		38 – 46 = – 8
		38	
1700	733		30 – 38 = – 8
		30	
1800	763		22 – 30 = – 8
		22	
1900	785		

(b) Calculate the **2nd Differences**. Does it imply a **quadratic relation**? **YES**. Explain.

The 2nd Differences are equal

→QUADRATIC



CHAPTER 5.2 (PART 2) USING TECHNOLOGY FOR QUADRATIC REGRESSION

EXAMPLE

Airplane Power Settings

Power setting (RPM)	Range (km)
1500	649
1600	695
1700	733
1800	763
1900	785

QUADRATIC REGRESSION (STEPS)

1. Launch DESMOS

2. Press +

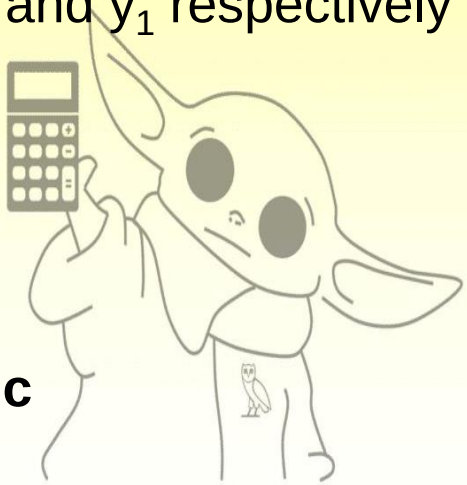
3. Select table

4. Create a table of values by entering the x and y values under the x_1 and y_1 respectively

5. Press +

6. Select $f(x)$ expression

7. Enter $\mathbf{y_1 \sim ax_1^2 + bx_1 + c}$



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CHAPTER 5.2 (PART 2) USING TECHNOLOGY FOR QUADRATIC REGRESSION

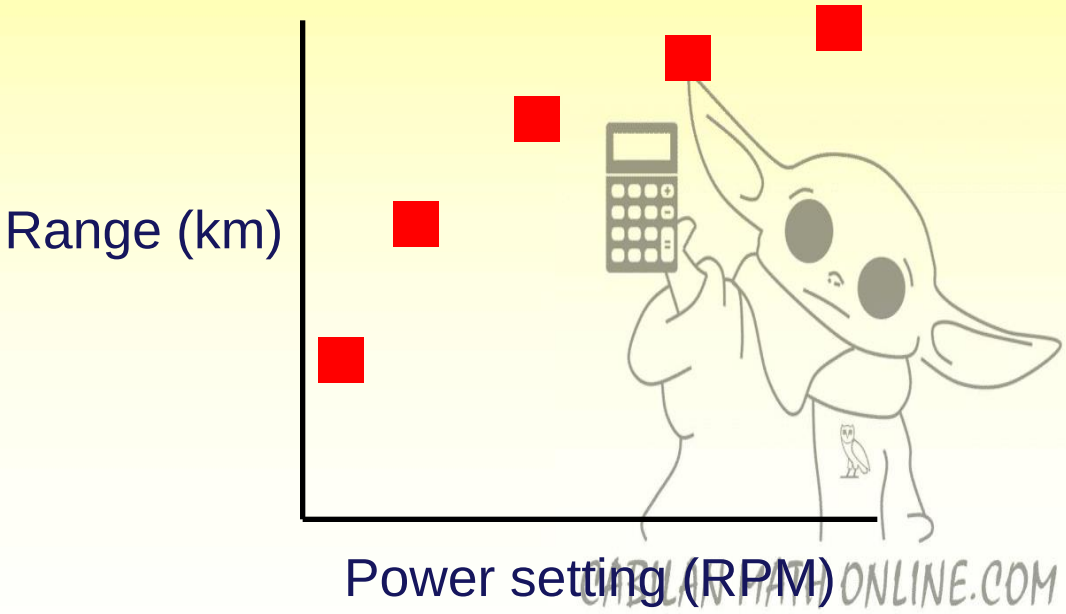
EXAMPLE

Airplane Power Settings

Power setting (RPM)	Range (km)
1500	649
1600	695
1700	733
1800	763
1900	785

QUADRATIC REGRESSION (STEPS)

Sketch the graph and complete the table below



CHAPTER 5.2 (PART 2) USING TECHNOLOGY FOR QUADRATIC REGRESSION

EXAMPLE
Airplane Power Settings

REGRESSION ANALYSIS and QUADRATIC EQUATION OF BEST FIT

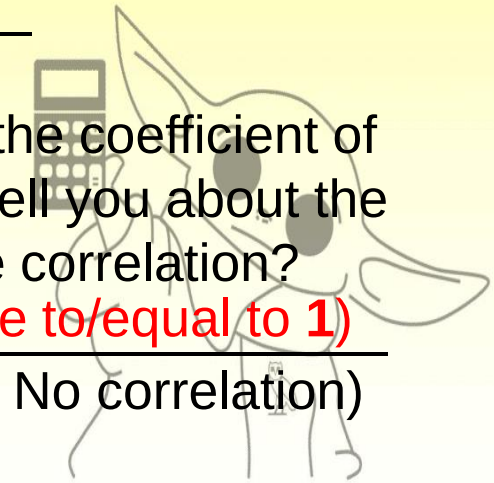
4. Press **ENTER** to execute. Fill the information that is given to you:

QuadReg
$y = ax^2 + bx + c$
$a = -0.0004$
$b = 1.7$
$c = -1001$
$R^2 = 1$

(a) Write the **quadratic equation of best fit**
$y = -0.0004x^2 + 1.7x - 1001$

(b) What is the value of the **coefficient of determination**?
$R^2 = 1$

(c) What does the coefficient of determination tell you about the **strength** of the correlation?
Strong (close to/equal to **1**)
(Strong, Weak, No correlation)



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REGRESSION ANALYSIS and QUADRATIC EQUATION OF BEST FIT

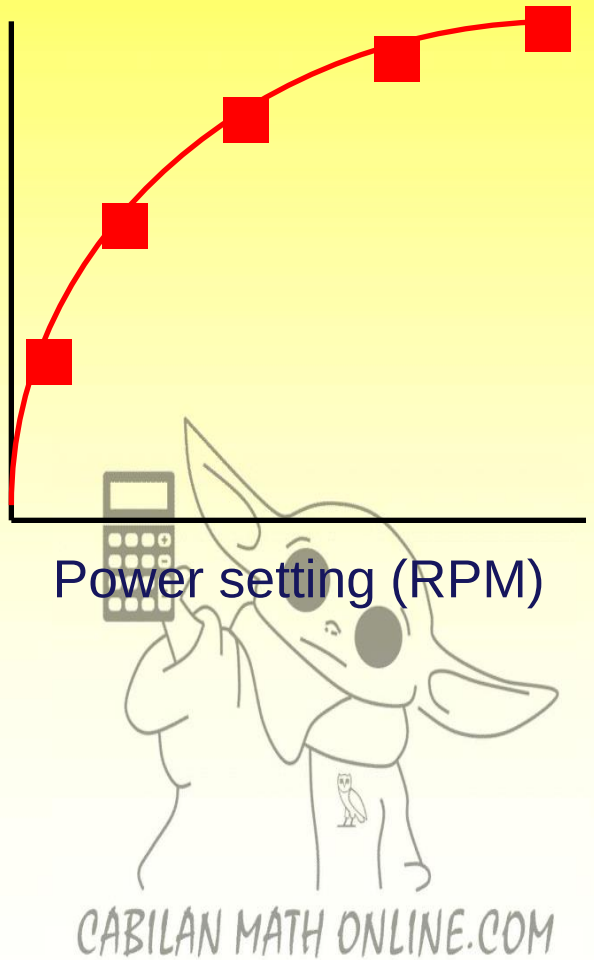
EXAMPLE

Airplane Power Settings

Determine the **power setting** that will result in **maximum range** by clicking on the *maximum* point

Answer: The power setting that will result in maximum range is

2125 RPM



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SEATWORK

Using the graphing calculator, answer **Page 291 Question #6** and complete questions in notes