

Math 3201

6.4 Modelling Data Using Exponential Functions

Exponential Regression

Recall that back in Unit 5 we graphing calculators to perform linear, quadratic and cubic regressions on that data sets. Here, we will do the same for exponential data.

Example 1:

The following table shows the household expenditure in Newfoundland and Labrador for the period of 2000 to 2009. Examples of household expenditures include food, shelter, transportation, health care, personal care, education, and recreation.

Year	2000	2001	2002	2003	2004	2005
Household Expenditure	43 501	45 759	46 597	47 944	49 126	52 306

Year	2006	2007	2008	2009
Household Expenditure	53 939	55 007	57 713	57 605

You may find it beneficial to rewrite the variable to be $t =$ years since 2000 and then $H(t) =$ household expenditure t years after 2000.

t	0	1	2	3	4
$H(t)$	43 501	45 759	46 597	47 944	49 126

(A) Using Desmos Graphing at <http://www.desmosgraphing.com>, we will enter the above table and perform a exponential regression. Then do the following:

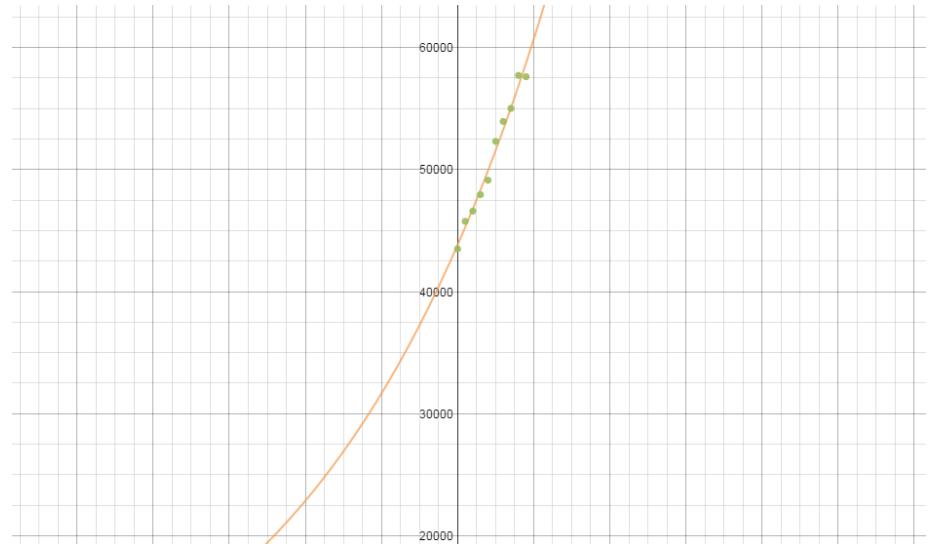
- Construct a scatter plot to display the data.
- Does your graph appear to have an exponential curve pattern? Explain your reasoning.
- Determine the equation of the exponential regression function that models the data.
- Graph the curve of best fit.

Select the table app, from the drop down menu on the left. Enter the data:

x_1	y_1
0	43501
1	45759
2	46597
3	47944
4	49126
5	52306
6	53939
7	55007
8	57713
9	57605

To perform a **exponential** regression in Desmos Graphing, you use the following command:

$y_1 \sim a(b)^{x_1}$, which appears as: $y_1 \sim a(b)^{x_1}$



Using Desmos, do the following:

(B) According to this exponential model, what will be the household expenditure for the year 2020? Are there any factors that might cause the actual amount to be different from the amount projected by this model?

\$83980.73

Yes. In difficult economic times household expenditure will go down.

In good economic times, it will go up.

Example 2:

The following table shows the average undergraduate university tuition fees paid by full time Canadian students:

School Year	Tuition Fee
2004-2005	\$4140
2005-2006	\$4214
2006-2007	\$4400
2007-2008	\$4558
2008-2009	\$4747
2009-2010	\$4942
2010-2011	\$5146
2011-2012	\$5366

(A) Using graphing technology, construct a scatter plot to display the data.

(B) Does your graph appear to have an exponential curve pattern?

yes.

(C) Use exponential regression to define a function that models the data.

$$a = 4083 \quad b = 1.0392 \quad y = 4083(1.0392)^x$$

(D) Estimate the tuition for the school year 2015 - 2016.

$$x = 12 \quad y = 4083(1.0392)^{12} = \$6476.93$$

Textbook Questions: page p. 377 - 378 #3(c), 4, c (use your equation to get the mass), d, 6(b,c)

Note: The graphing calculator printouts are given below for the exponential regression for each question assigned from the textbook.

ExpReg y = a*b^x a = 9595.4335 b = 1.0385
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ExpReg y = a*b^x a = 26.9345 b = 1.0081
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ExpReg y = a*b^x a = 14.4295 b = 1.0651
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