1) Stat, Edit
2) Stat, Calc, 0: ExpReg

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Algebra I

Exponential Regression Equations

1. The accompanying table shows the number of bacteria present in a certain culture over a 5-hour period, where x is the time, in hours, and y is the number of bacteria.

Write an exponential regression equation for this set of data, rounding all values to *four decimal places*. Using this equation, determine the number of whole bacteria present after 6.5 hours.

x	y
0	1,000
1	1,049
2	1,100
3	1,157
4	1,212
5	1,271

ExpReg
$y = a(b)^x$
$y = 999.9725(1.0493)^x$
$y = 999.9725(1.0493)^{6.5}$
$y = 1367$

2. The accompanying table shows the amount of water vapor, y, that will saturate 1 cubic meter of air at different temperatures, x.

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*. Using this equation, predict the amount of water vapor that will saturate 1 cubic meter of air at a temperature of 50°C, and round your answer to the *nearest tenth of a gram*.

Amount of Water Vapor That Will Saturate 1 Cubic Meter of Air at Different Temperatures

Air Temperature (x) (°C)	Water Vapor (y) (g)
–20	1
–10	2
0	5
10	9
20	17
30	29
40	50

ExpReg
$y = a(b)^x$
$y = 4.144(1.068)^x$
$y = 4.144(1.068)^{50}$
$y = 112.5$

3. Jean invested $380 in stocks. Over the next 5 years, the value of her investment grew, as shown in the accompanying table.

Write the exponential regression equation for this set of data, rounding all values to *two decimal places*. Using this equation, find the value of her stock, to the *nearest dollar*, 10 years after her initial purchase.

Years Since Investment (x)	Value of Stock, in Dollars (y)
0	380
1	395
2	411
3	427
4	445
5	462

ExpReg
$y = a(b)^x$
$y = 379.92(1.04)^x$
$y = 379.92(1.04)^{10}$
$y = 562$

4. The following table represents the amount of student loan debt Dr. Ross has x years after 2010. Write an exponential regression equation to represent the amount of debt Ross will have left have left after x years. Round all coefficients to the *nearest thousandth*.
Assuming the pattern continues, in what year will Ross have $10,000 left in debt?

Years after 2010	Debt in Dollars
0	120,000
1	112,541
3	88,897
4	76,441
6	53,289

ExpReg
$y = a(b)^x$
$a = 126565.191$
$b = .874$
$y = 126565.191(.874)^x$

$\frac{10{,}000}{126565.191} = \frac{126565.191(.874)^x}{126565.191}$
$\log .079... = \log .874^x$
$\frac{\log .079...}{\log .874} = \frac{x \log .874}{\log .874}$
$8.84 = x$
2010 + 18 = 2028

5. Consider the data in the table below.
State an exponential regression equation to model these data, rounding all values to the *nearest thousandth*. Use your equation to find x when y is 100, rounding to the *nearest tenth*.

x	1	2	3	4	5	6
y	3.9	6	11	18.1	28	40.3

ExpReg
$y = a(b)^x$
$a = 2.458522514$
$b = 1.61590017$
$y = 2.459(1.616)^x$

$100 = 2.459(1.616)^x$
$\frac{100}{2.459} = \frac{2.459(1.616)^x}{2.459}$
$\log 40... = \log 1.616^x$
$\frac{\log 40...}{\log 1.616} = \frac{x \log 1.616}{\log 1.616}$
$7.7 = x$

6. A runner is using a nine-week training app to prepare for a "fun run." The table below represents the amount of the program completed, *A*, and the distance covered in a session, *D*, in miles.

Based on these data, write an exponential regression equation, rounded to the *nearest thousandth*, to model the distance the runner is able to complete in a session as she continues through the nine-week program. After how much of the program is completed will the runner complete 2.5 miles? Round your answer to the *nearest hundredth*.

amount of program completed
distance covered

A	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{8}{9}$	1
D	2	2	2.25	3	3.25

ExpReg
$y = a(b)^x$
$a = 1.223$
$b = 2.652$
$y = 1.223(2.652)^x$
$D = 1.223(2.652)^A$

$\frac{2.5}{1.223} = \frac{1.223(2.652)^A}{1.223}$
$2.04... = 2.652^A$
$\frac{\log 2.04...}{\log 2.652} = \frac{A \log 2.652}{\log 2.652}$
$.73 = A$