Data Collection and Analysis Name:____**Sample Answers**____

Date:_____

Activity: Cooking the Thanksgiving Day Turkey

Collecting the data

Record your data in the table below.

Time (hours)	Temperature of Turkey (Fahrenheit)	Temperature difference between Turkey and Oven (Fahrenheit) 325 is the temp of the oven
0	40	285
1	105	220
2	128	197
3	155	170
4	170	155

Analyze the data

Use the equation you find in number 1 to answer questions 2 through 4.

1. Find an equation for the data in **L1** and **L2** using Newton's Law of Heating

y = _____

L1	L2	L3
0	40	285
1	105	220
2	128	197
3	155	170
4	170	155

$T(t) = T_\alpha + (T_0 - T_\alpha)\cdot e^{kt}$

$T(t) = 325 + (40 - 325)\cdot e^{kt}$

$\text{Solve}(105 = 325 + (40 - 325)\cdot e^{(k\cdot 1)}, k)$ $= k = -.258862$

$T(t) = 325 + (40 - 325)\cdot e^{(-.258862\cdot t)}$

Enter your equation in Y1 in the TI-83 Plus.

The first equation was not a good fit. Try using another point.

$T(t) = 325 + (40 - 325)\cdot e^{kt}$

$\text{Solve}(128 = 325 + (40 - 325)\cdot e^{(k\cdot 2)}, k)$ $= k = -.184643$

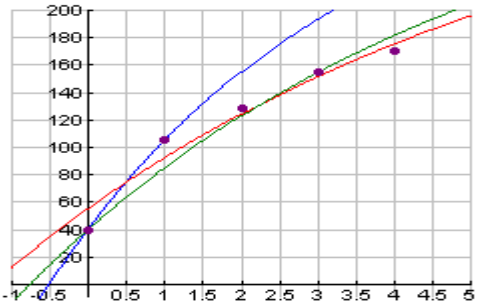
$T(t) = 325 + (40 - 325)\cdot e^{(-.184643\cdot t)}$

The second equation I came up was a bit better, but I'll try one more point of data.

$T(t) = 325 + (40 - 325)\cdot e^{kt}$

$\text{Solve}(155 = 325 + (40 - 325)\cdot e^{(k\cdot 3)}, k) \quad = k = -.17223$

$T(t) = 325 + (40 - 325)\cdot e^{(-.17223\cdot t)}$



From looking at my results from all 3 I feel that my second equation was the best one to work with.

$T(t) = 325 + (40 - 325)\cdot e^{(-.184643\cdot t)}$

2. What is the temperature of the turkey after one and a half hours? _____

$325 + (40 - 325)\cdot e^{(-.184643\cdot 1.5)} \quad = 108.947$ degrees Fahrenheit

3. How long has the turkey been in the oven when the temperature of the turkey is 100°F? _____

$\text{Solve}(100 = 325 + (40 - 325)\cdot e^{(-.184643\cdot t)}, t) \quad = t = 1.28025$

One hour and approximately 17 minutes

4. A turkey should be cooked until it reaches a temperature of 180°F. At what time should the turkey be taken out of the oven? _____

$\text{Solve}(180 = 325 + (40 - 325)\cdot e^{(-.184643\cdot t)}, t) \quad = t = 3.65979$

Three hours and approximately 40 minutes

5. Find an equation for the data in **L1** and **L3**

y = _____

$y = a \cdot b^x$

$285 = a \cdot b^0$

$a = 285$

$y = 285 \cdot b^x$

$\text{Solve}(170 = 285 \cdot b^3, b) \quad = b = .841785$

$y = 285 \cdot .841785^x$

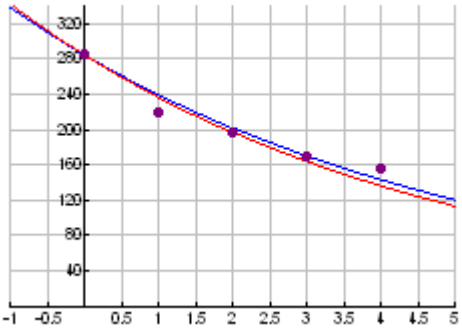
I used t=3 and 325-temp=170 data point, but I think it would work better with the data point at t=2.

$y = 285 \cdot b^x$

$\text{Solve}(197 = 285 \cdot b^2, b) \quad = b = .831401 \text{ or } b = -.831401$

$y = 285 \cdot .831401^x$

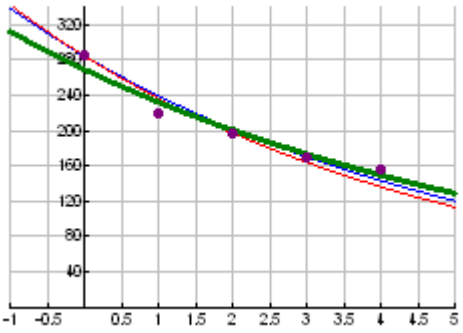
However, when I graphed the second set of data it did not give as close of an equation. So I am going to work with the first equation that I came up with.



6. Enter the equation from your calculator for the exponential regression

y = _____. y = 269.589*0.86278^x

Exponential Equation of Oven - Turkey temps vs. time
Exponential Regression
regEQ(x) = 269.589*.86278^x
a = 269.589
b = .86278
r = -.981629
r^2 = .963596



7. Is this equation close to the equation you came up with? ____yes___

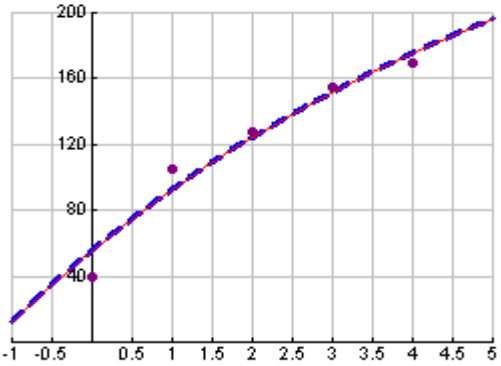
What could you have done to come up with a more accurate equation? __instead of using the data points at t=0 and at t = 3, I could have used the data points at t = 2 and t = 3 to come up with the exponential equation____

8. Knowing how we changed the data and equation to an exponential equation from Newton's Law of Heating, use your exponential equation from problem 6 to write an equation for the data of time vs. temperature of the turkey **(L1** vs. **L2).**

y = _____

$T(t) = 325 - 269.589 \cdot 0.86278^{t}$

9. How does this equation compare to your equation in problem 1? _____They look the same. WOW! :O)_____



10. Explain any discrepancies between your data points (**L1** vs. **L2**) and your equation in problem 9.

The discrepancies would be from opening and closing the oven and misreading the temperature and/or being off slightly on the times that I read the turkey's temperature.