**Activity 5.5.4: The Cost of a Used Car**

Ari is planning on purchasing a used Toyota Corolla. He has done some online research at Edmonds.com (in the year 2015) on the minimum cost of used Corollas based on the year of the car and noticed a pattern. He found that the minimum cost of the car is a logarithmic function of the age of the car.

His data is shown here.

|  |  |  |
| --- | --- | --- |
| **Year** | **Numbers of Years Ago** | **Minimum Cost** |
| 2010 | 5 | $9,833 |
| 2009 | 6 | $8,534 |
| 2008 |  | $6,707 |
| 2007 |  | $6,405 |
| 2006 |  | $5,753 |
| 2005 |  | $4,978 |
| 2004 |  | $4,438 |
| 2003 |  | $3,865 |
| 2002 |  | $3,329 |

Make a scatter using your technology. Does the data look linear? Explain.

Does it look exponential? Explain.

Does it look logarithmic? Explain

He found that the minimum cost of the car is a logarithmic function of the age of the car.

You are going to use the 2009 and 2010 data to create a logarithmic model and then graphically determine if your model is a good fit. **The model we will use assumes there has been no horizontal shift.**

**Set-Up**

1. For the years 2009 and 2010, write ordered pairs representing the data.
2. The logarithmic model is of the form . Use your ordered pairs to write two logarithmic equations. Label one “Equation 1” and the other “Equation 2”.

**Solve for Parameters and**

You now have a nonlinear system of two equations. Remember that substitution is one option to solve for the parameters and .

1. For the substitution process, are you going to solve an equation for or for ? Why did you choose this parameter?
2. Solve Equation 1 for the parameter you chose.
3. Continue the substitution process and find values for and .
4. State the logarithmic model for this data.
5. Using technology, use your Stats calculate feature and obtain a logarithmic regression. Note: there is an r value of -.9928. What does this tell you?

**Evaluate the Model**

Graph the data and the logarithmic model on the same coordinate system. Ideally use your grapher.

1. Does your model appear to fit the data well? Explain.

If not, modify the values of and so the model better approximates the data.

1. Use your best model to approximate the minimum cost of a 1999 Corolla.
2. Use your best model to approximate the minimum cost of a 2013 Corolla.
3. Can you use your model to approximate the minimum cost of a 2015 Corolla? Explain.
4. Also graph the logarithmic regression you obtained using your technology. Does it fit better?