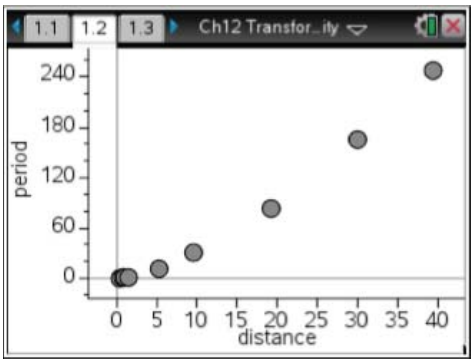
32. Transforming to achieve linearity on the calculator

We'll use the planet data on page 807 to illustrate a general strategy for performing transformations with logarithms on the TI-Nspire. A similar approach could be used for transforming data with powers and roots.

1. Insert a *Lists & Spreadsheet* page, and name column A **distance** and column B **period**. Type the corresponding values into each column.

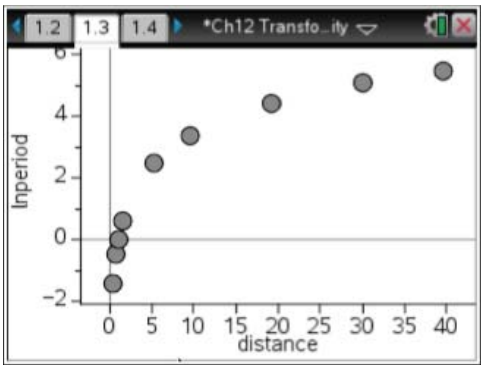
2. Make a scatterplot of y versus x and confirm that there is a curved pattern.

   - Insert a *Data & Statistics* page. Press (ctrl) [I] and select *Add Data & Statistics*.
   - Press (tab) and select **distance** for the horizontal axis. Press (tab) again and select **period** for the vertical axis.

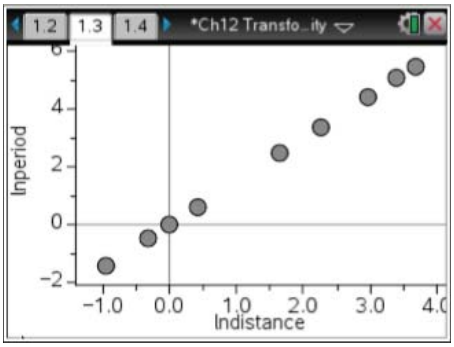


3. To "straighten" the curve (that is, determine the relationship), we can use different models of the explanatory-response data to see which one provides a linear relationship.
   - Press (ctrl) ◀ to return your spreadsheet. Name column c **lndistance** and column d **lnperiod**.
   - In the formula cell for **lndistance**, press (enter) and enter *ln(distance)* to take the natural log of the distance values.
   - Repeat the above step for **lnperiod** using the **period** data.

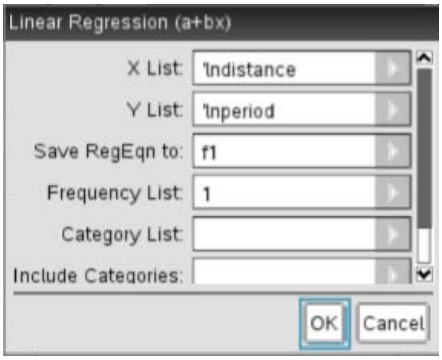
4. To see if an exponential model fits the data:
   - Insert another *Data & Statistics* page.
   - Put **distance** on the horizontal axis and **lnperiod** on the vertical axis. If the relationship looks linear, then an exponential model is appropriate.

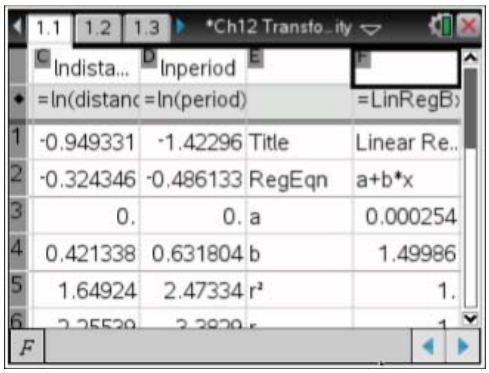


5. To see if a power model fits the data:
   - Using the same *Data & Statistics* page, change the horizontal axis to **lndistance**.
   - If this relationship looks linear, then a power model is appropriate.

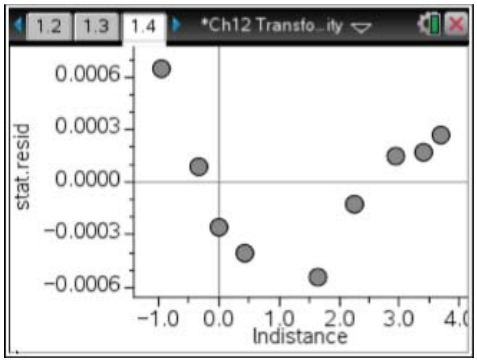


6. If a linear pattern is present, calculate the equation of the least-squares regression line:
   In the spreadsheet, press (menu) → *Statistics* → *Calculations* → *Linear Regression(a+ bx)*.
   In the dialogue box, select **lndistance** for *X List*, **lnperiod** for *Y List*, and enter the rest of the values as shown. (tab) to [OK] and press (enter).





7. Construct a residual plot to look for any departures from the linear pattern:
   Insert another *Data & Statistics* page.
   For the horizontal axis select **lndistance**. For Ylist, use the **stat.resid** list stored in the calculator.



8. To make a prediction for a specific value of the explanatory variable, compute log(*x*) or ln(*x*), if appropriate. Then do **f1**(*k*) to obtain the predicted value of log *y* or ln *y*. To get the predicted value of *y*, do 10^Ans or *e*^Ans to undo the logarithm transformation. Here's our prediction of the period of revolution for Eris, which is at a distance of 68.05 AU from the sun.