**Independent Practice with Linear Functions versus Exponential Functions**

Exponential functions, like linear functions, can be expressed by rules relating *x* and *y* values and by rules relating NOW and NEXT *y* values when an *x* value increases in steps of 1. Compare the patterns of (*x*, *y*) values produced by these functions: *y* = 2(3*x*) and *y* = 2 + 3*x* by completing these tasks.

1. For each function write another rule using NOW and NEXT that could be used to produce the same pattern of (*x*, *y*) values.
2. How would you describe the similarities and differences in the relationships of x and y in terms of their function graphs, tables, and rules?
   1. Similarities and differences of function graphs
   2. Similarities and differences of function tables
   3. Similarities and differences of function rules
3. When will the exponential function “overtake the linear function”? Will this happen all of the time or just some of the time? Explain your thoughts.



**U.S. Presidential Elections**

The following table shows the number of votes cast in a sample of U.S. Presidential elections between 1840 and 2004

|  |  |  |
| --- | --- | --- |
| **Year of Election** | **Major Party Candidates** | **Total Votes Cast** |
| 1840 | Harrison vs. Van Buren | 2,411,118 |
| 1860 | Lincoln vs. Douglas | 4,685,030 |
| 1880 | Garfield vs. Hancock | 9,218,951 |
| 1900 | McKinley vs. Bryan | 14,001,733 |
| 1920 | Harding vs. Cox | 26,757,946 |
| 1940 | Roosevelt vs. Wilkie | 49,752,978 |
| 1960 | Kennedy vs. Nixon | 68,836,385 |
| 1980 | Reagan vs. Carter | 86,515,221 |
| 2000 | Bush vs. Gore | 105,405,100 |
| 2004 | Bush vs. Kerry | 122,267,553 |

1. Find rules for what you think are the best possible linear and exponential models of the trend relating votes cast to time (use *t* = 0 to represent the year 1840).

Linear model:

Exponential model:

1. Which type of model – linear or exponential – seems to better fit the data pattern? Why do you think that choice is reasonable?
2. In what ways is neither the linear nor the exponential model a good fit for the data pattern relating presidential election votes to time? Why do you think that modeling problem occurs?