**Identifying Exponential Functions**

Exponential functions have the variable as an exponent. If we want to identify a function as being exponential we can look at the results of the function and see that the x will be increased by a fixed amount and the results of the function will be increased by a fixed multiple amount.

Linear functions have constant first differences

Quadratics have constant second differences

Exponential functions do not have constant differences but do have constant ratios

For example : f(x) = 2 \* 3x

|  |  |
| --- | --- |
| x | y |
| 0 | 2 |
| 1 | 6 |
| 2 | 18 |
| 3 | 54 |
| 4 | 162 |

We can see that we multiple each result by 3, so it is an exponential function

So we can see that our results are growing by a multiple of 3 so it is an exponential function from the data.

|  |  |
| --- | --- |
| x | y |
| -2 | -5 |
| 0 | 5 |
| 2 | 10 |
| 4 | 30 |

We are going up by a constant amount and we multiply results by -1, 2, 3 – it is not a constant multiple, so it is not an exponential function.

|  |  |
| --- | --- |
| x | y |
| 2 | 8 |
| 3 | 4 |
| 4 | 2 |
| 5 | 1 |

For the above data we see that the results are going down by a constant multiple, ½. So it is an exponential function. What is it? Using the calculator and the ExpReg function we get

32\*(1/2)x

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|  |  |
| --- | --- |
| x |  |
| 0 | 40000 |
| 1 | 32000 |
| 2 | 25600 |
| 3 | 20480 |

When you divide 32000/40000 you get .8

Divide 35600 / 3200 you get .8

So we have a constant ratio which means we have an exponential functiom

Usinr The ExpReg function we get 40000\*.8^x

|  |  |
| --- | --- |
| http://www.regentsprep.org/Regents/math/algtrig/ATP8b/expgraph2.gif | If the base is greater than 1, as x increases y will go up dramatically. For negative x numbers, y will quickly approach 0.  (2^-4) = 1 / 2^4  If the base is less than 1, the number will quickly approach 0, as x increases.  (1/2)^5 = 1/32  As x is decreases y will increase  (1/2)^-4 = 2^4 |

|  |  |
| --- | --- |
|  | Let’s look at  -3 \* 2^x  We can see that the negative 3 causes a reflection over the y axis. |