Graphing Logarithm and Trigonometry Functions

ID1050– Quantitative & Qualitative Reasoning

A Trigonometry Graphing Example

In a previous tutorial, we graphed point-by-point some simple functions involving the basic operations of addition, subtraction, multiplication, and division.

What about a function with which we may not be familiar?

- Graph $y=\sin(x)$ for $-360° \leq x \leq 360°$
- What should our step size be?
  - If we choose 1 degree steps, we'll need 360-(-360)=720 points. Too many!
  - If we want about 15 points, divide $720°$ by 15. That gives us a step size of $48°$. Let's round that to an even $45°$, which will give us $720° / 45° = 16$ points.
  - The interval size doesn't matter; in the end, the graph will look the same. Choose the step size for convenience and to give you enough points to plot.

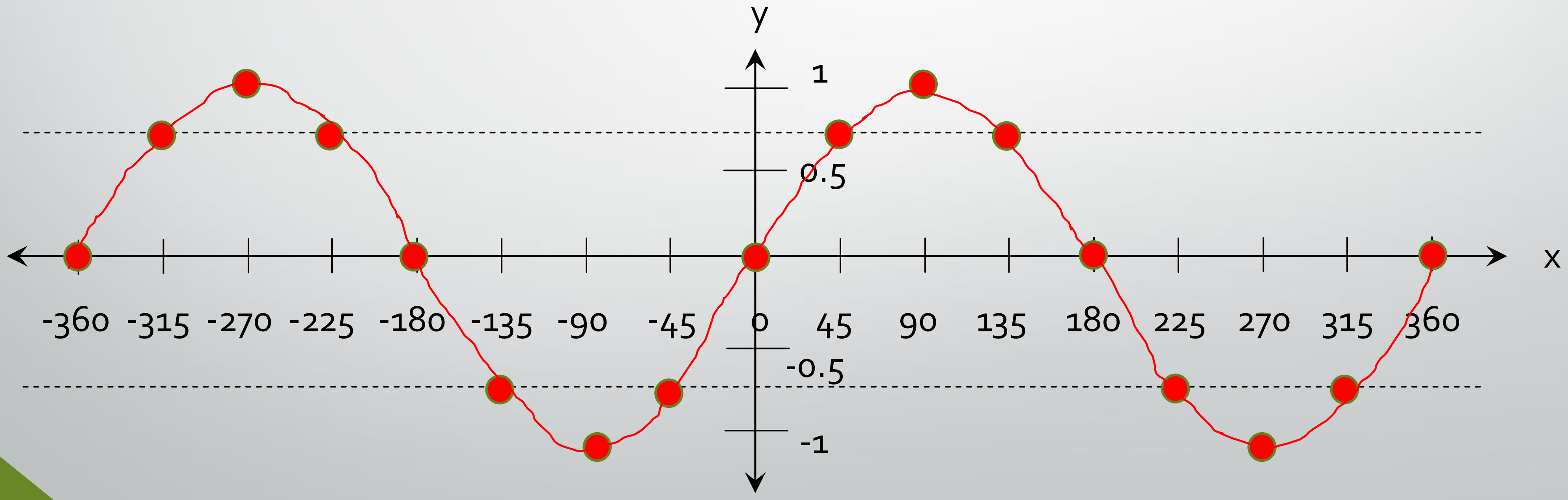
A Trigonometry Graphing Example (continued)

- Our table will be a bit bigger than usual.
- First, fill out the x values, starting at $-360°$ and stepping up by $45°$ each time.
- Enter each x value in the calculator and compute the sine function of it.
- Round your answers to a reasonable amount. Since we're graphing, let's keep only one or two digits of accuracy.
- We note that the y-value only goes between -1 and +1, so we scale our axes to match the table values.

x (degrees)	y
-360	0
-315	0.71
-270	1
-225	0.71
-180	0
-135	-0.71
-90	-1
-45	-0.71
0	0
45	0.71
90	1
135	0.71
180	0
225	-0.71
279	-1
315	-0.71
360	0

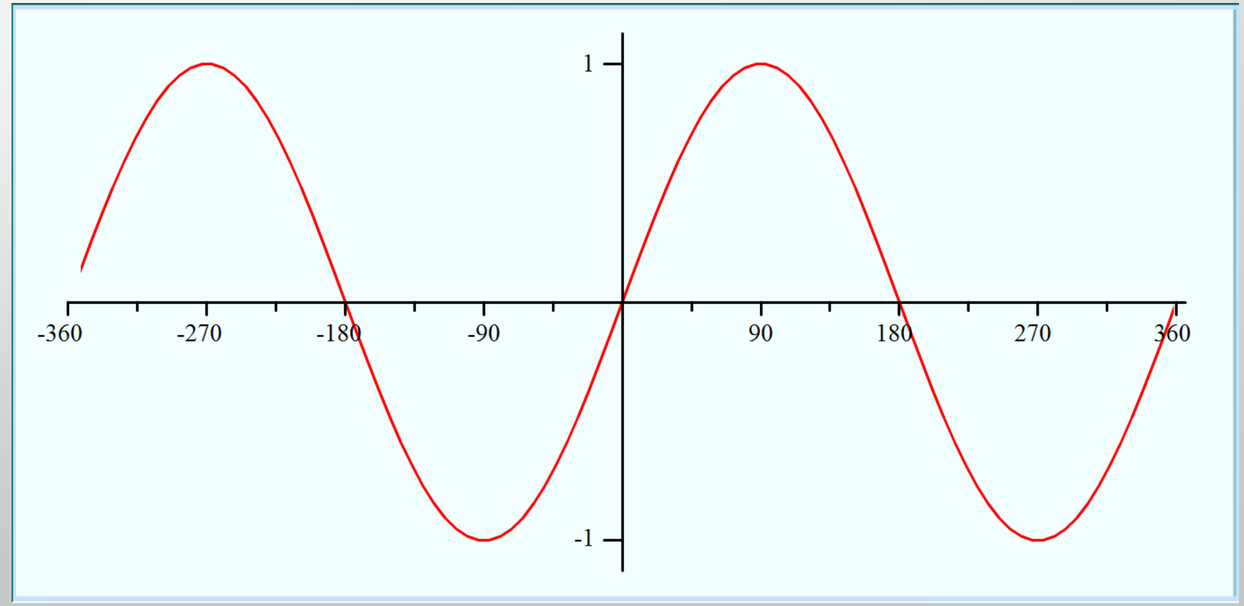
A Trigonometry Graphing Example (continued)

- Here are the axes. Plot the points, and connect the dots.
- We see a wave shape emerge, and it looks like it continues on left and right.



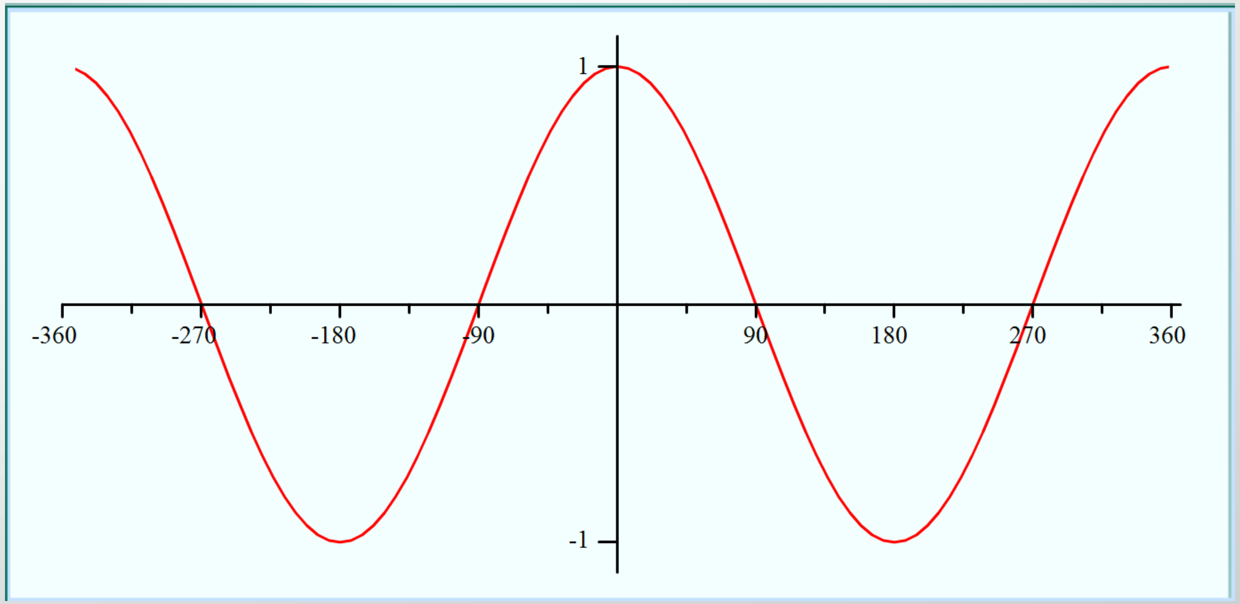
Trigonometry: Sine

- Computers can patiently plot many more points than we can
- Many calculators can plot functions, and there are many applications on the internet that can do the same. Here is one: http://go.hrw.com/math/midma/gradecontent/manipulatives/GraphCalc/graphCalc.html
- Let's use this application to plot the sine function. We'll talk about the details of how to do this in a later tutorial, but here is the result:
- Observations
  - The sine crosses through the origin



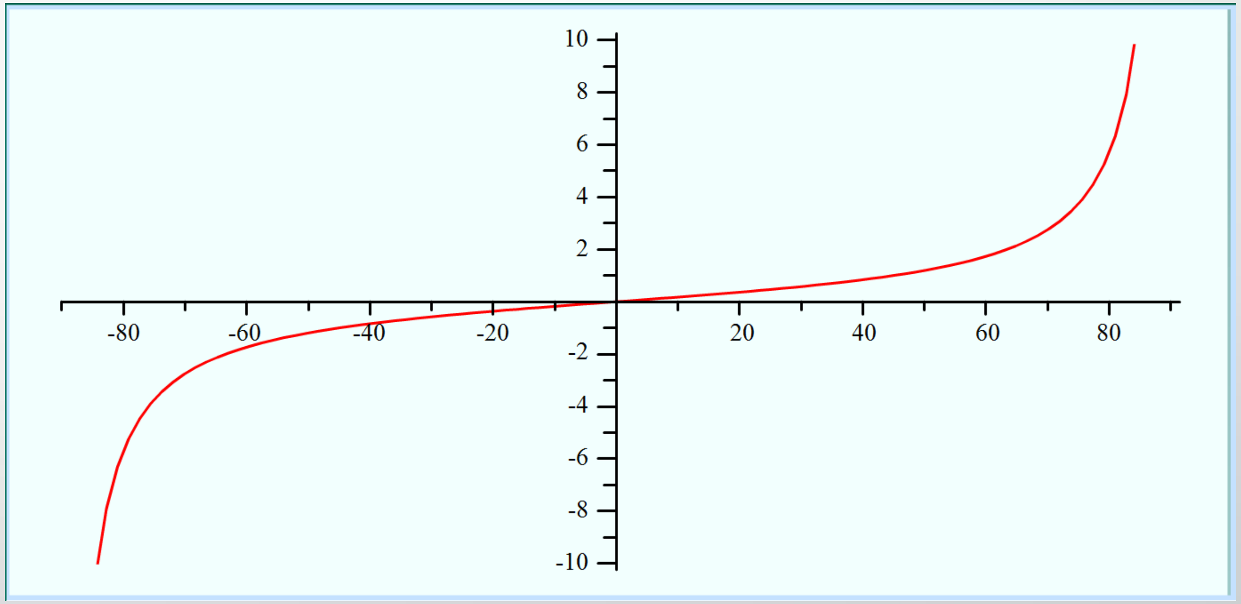
Trigonometry: Cosine

- Graph $y = \cos(x)$ for $-360° \leq x \leq 360°$
- Observations:
  - This graph looks very similar to the sine function
  - It is different because it does not pass through the origin
  - This is also a wave function



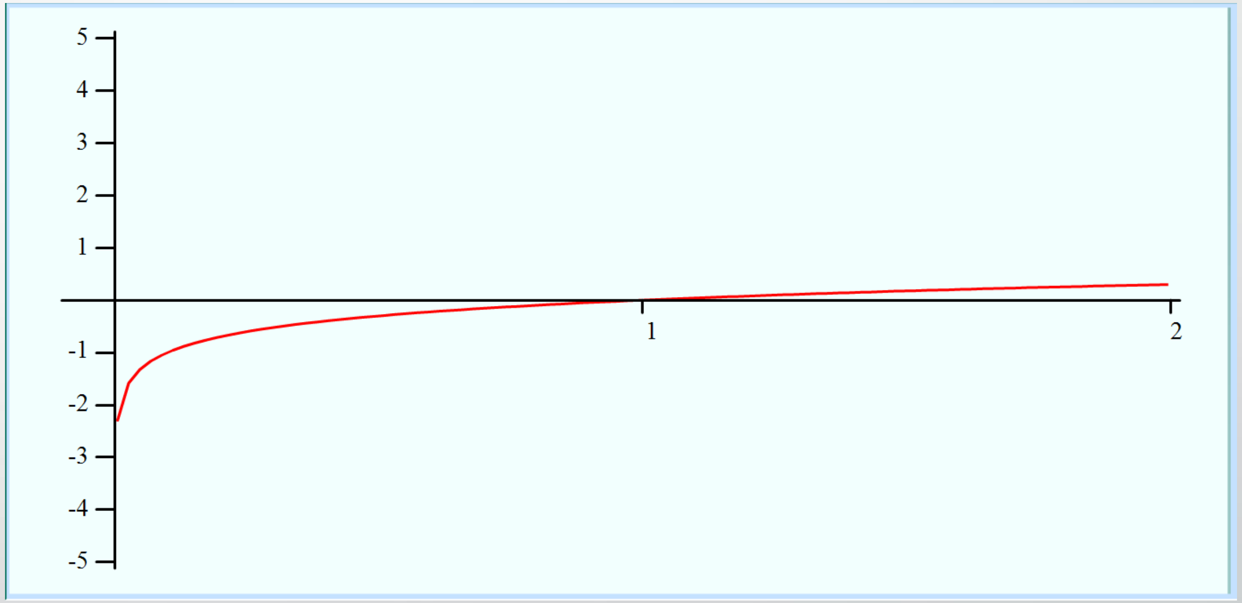
Trigonometry: Tangent

- Graph `y=tan(x)` for $-90° < x < 90°$
- Observations:
  - We can't compute the tangent function at x=-90º or at x=90º
  - It looks like the function becomes infinite at these two values
  - Tangent is negative for negative angles and positive for positive angles



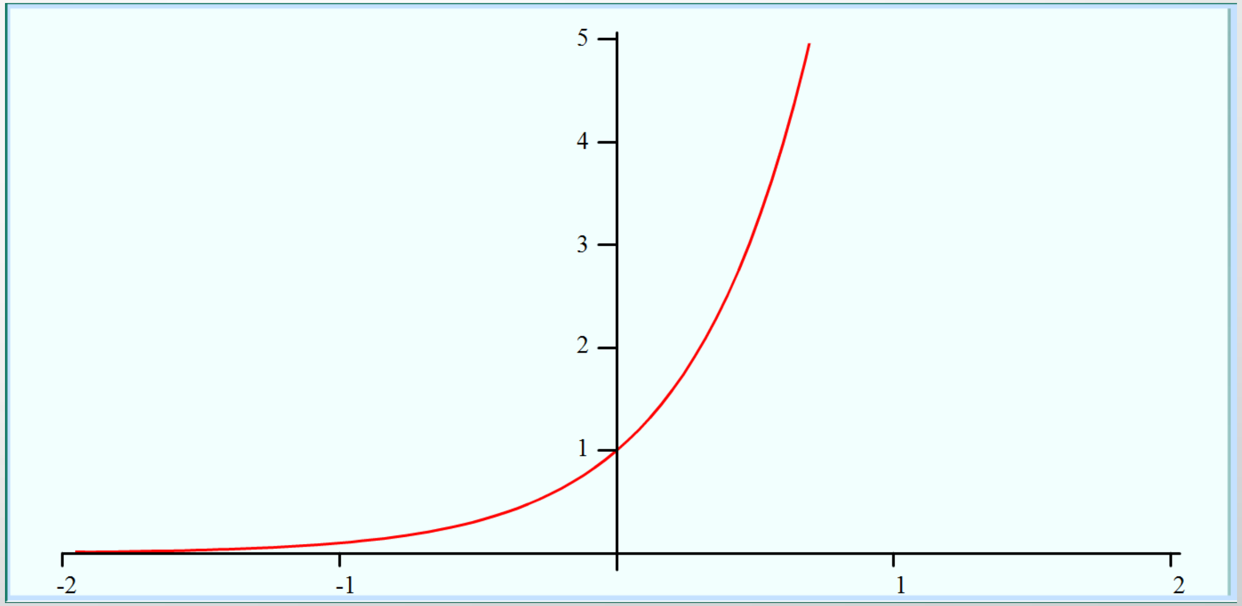
Logarithms: Common Log

- Graph `y=log(x)` for $0 < x \leq 2$
- Observations:
  - We can't compute the logarithm for x=0
  - The function goes to negative infinity at x=0
  - The function crosses the x-axis at x=1 and gradually keeps rising
  - There is no graph for negative x-values (log is not defined here)



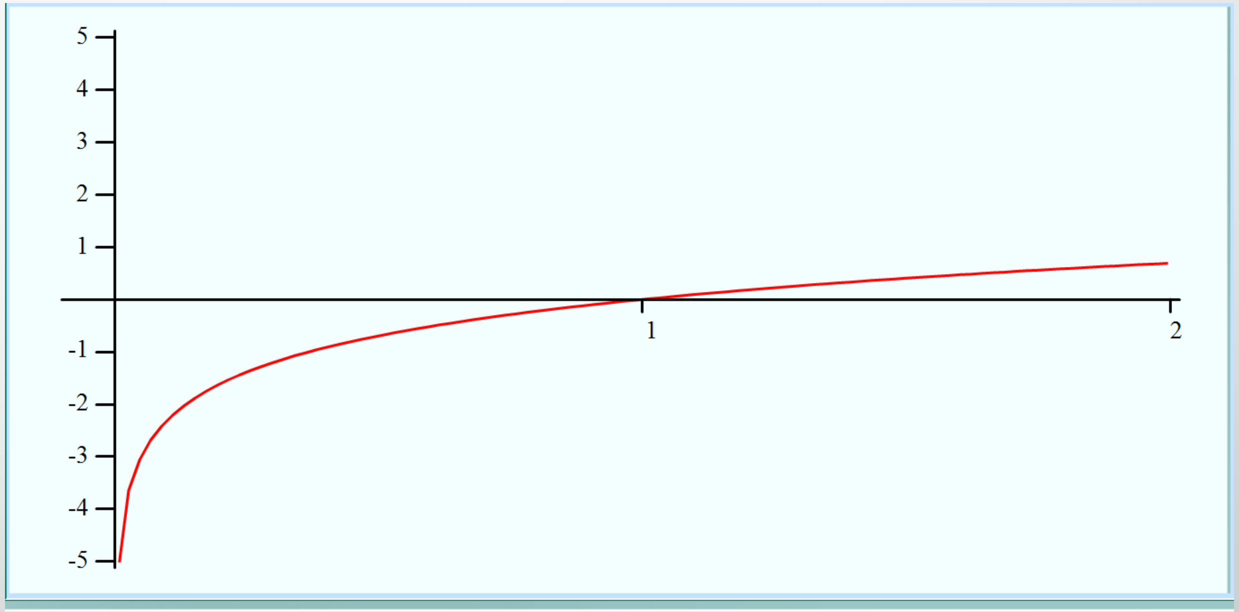
Logarithms: Common Anti-log

- Graph $y = \log^{-1}(x)$ (or $y = 10^x$) for $-2 \leq x \leq 2$
- Observations:
  - The function is always a positive number
  - It is very small for large negative numbers
  - It is very large for large positive numbers
  - It crosses the y-axis at y=1



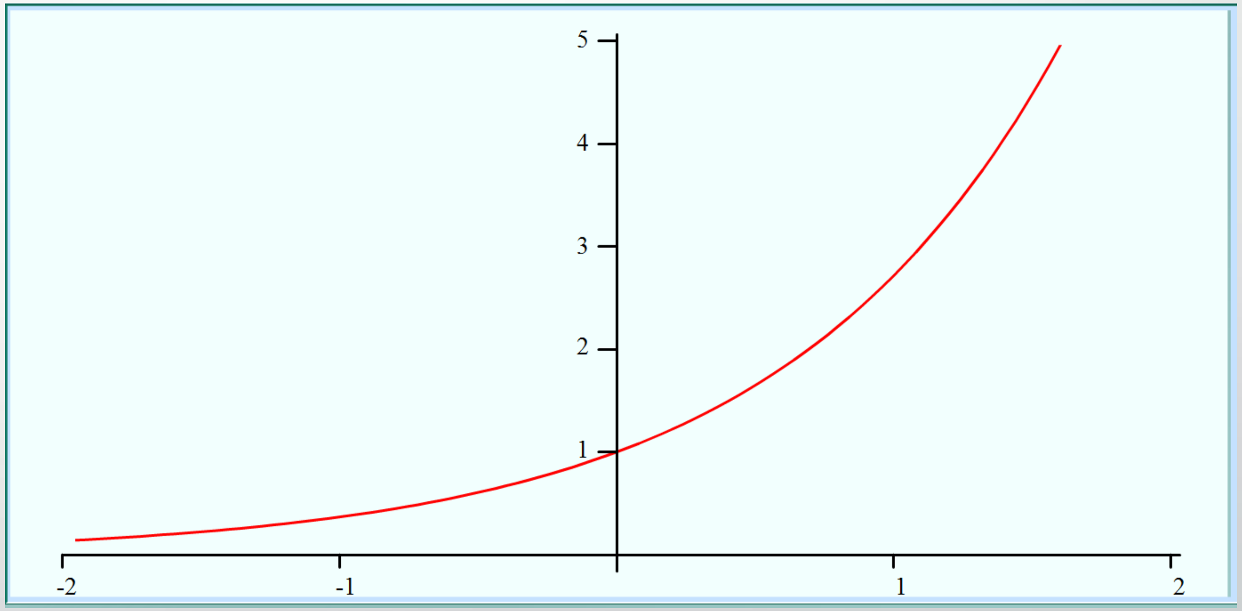
Logarithms: Natural Log

- Graph `y=ln(x)` for $0 < x \leq 2$
- Observations:
  - This looks almost identical to the graph for log(x). They are similar, but the curving is slightly different
  - This function goes to infinity for x=0, and crosses the x-axis at x=1



Logarithms: Natural Anti-log

- Graph $y=\ln^{-1}(x)$ (or $y=e^x$) for $-2 \leq x \leq 2$
- Observations:
  - This graph looks very similar to the common anti-log graph
  - The differ in the amount of curvature they have, but are otherwise quite similar



Conclusion

- These are the graphs of some important functions used in mathematics
- Without knowing what the functions do, we can get a sense of how they behave by looking at their graphs
  - When the cross axes
  - When they aren't defined
  - Where they are positive or negative
  - Etc.