Math 121 (Lesieutre); §5.3; September 11, 2017

1. What is an exponential function?

2. Sketch the graphs of the following exponential functions by first making a table of values.

$$f(x) = 2^x, \qquad g(x) = \left(\frac{1}{2}\right)^x, \qquad h(x) = -2^x.$$

3. Using transformations of graphs, graph the following function:

$$F(x) = 3 - 2^{x+1}$$

4. What is e? Two ways to define it:

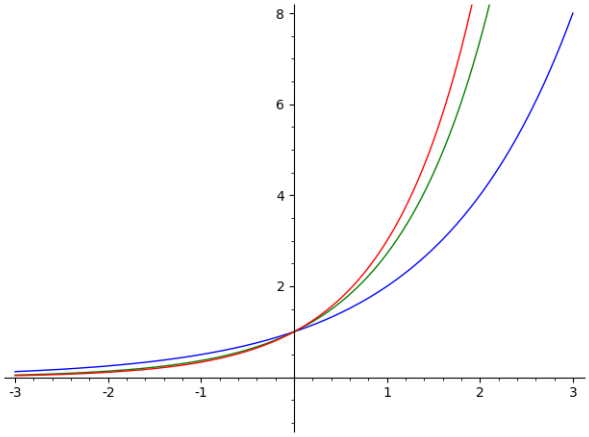
$$e = \lim_{n\to\infty} \left(1 + \frac{1}{n}\right)^n \qquad e = \sum_{j=0}^{\infty} \frac{1}{j!} = 1 + \frac{1}{1} + \frac{1}{1\cdot 2} + \frac{1}{1\cdot 2\cdot 3} + \cdots$$

n	$\left(1+\frac{1}{n}\right)^n$
1	2.0000000
10	2.5937425
100	2.7048138
1000	2.7169239
10000	2.7181459
100000	2.7182682
1000000	2.7182805
10000000	2.7182817

n	$\sum_{j=0}^{n} \frac{1}{j!}$
0	1.0000000
1	2.0000000
2	2.5000000
3	2.6666667
4	2.7083333
5	2.7166667
6	2.7180556
7	2.7182540

5. e is in many ways a number like π. It's irrational, so we express it using a symbol: however, don't forget that it isn't a variable! We can still graph exponential functions with e as the base.

Here are the graphs of $f(x) = 2^x$, $g(x) = e^x$, and $h(x) = 3^x$. Can you tell which is which?



Sketch the graph of $y = e^{-x}$ on the same axes.

6. How different are exponential and linear growth? Let's check by making a table of values for the following functions:

$$f(x) = 2x + 1, \qquad g(x) = 3^x$$

7. Now let's consider some exponential equations, and how to solve them.

$$2^{2x} = 16, \quad 3^{x+4} = \frac{1}{27}, \quad 8^{-x+14} = 16^x, \quad e^{x^2} = e^{3x} \cdot e^{-2}.$$