

$$f(x) = e^x$$

We've worked with 2^x , 3^x , etc. Now we have e^x .

What is e? e is a very important number.

Definition: e is the "limiting value" of $\left(1 + \frac{1}{x}\right)^x$ as x grows to infinity.
 $e \approx 2.718281828459$.

It is an irrational number, like π . This means it cannot be written as a fraction nor as a terminating or repeating decimal. Unless otherwise asked, leave e and π as e and π ! Do not approximate!

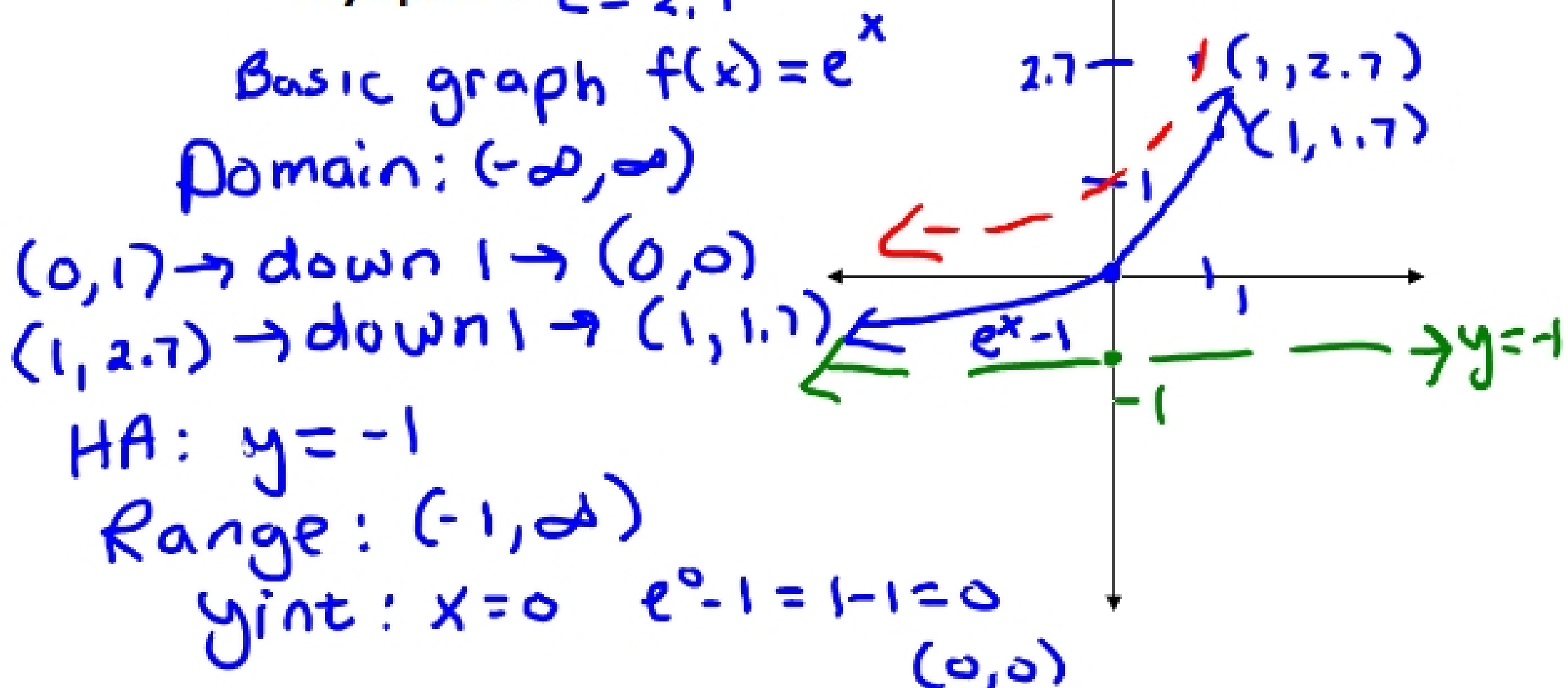
Remember: e is a number, just as 2, 3, and 17 are numbers. So it can be treated the same way.

Believe it or not: $f(x) = e^x$ is a much "nicer" function than

$$f(x) = 2^x.$$

Example 1:

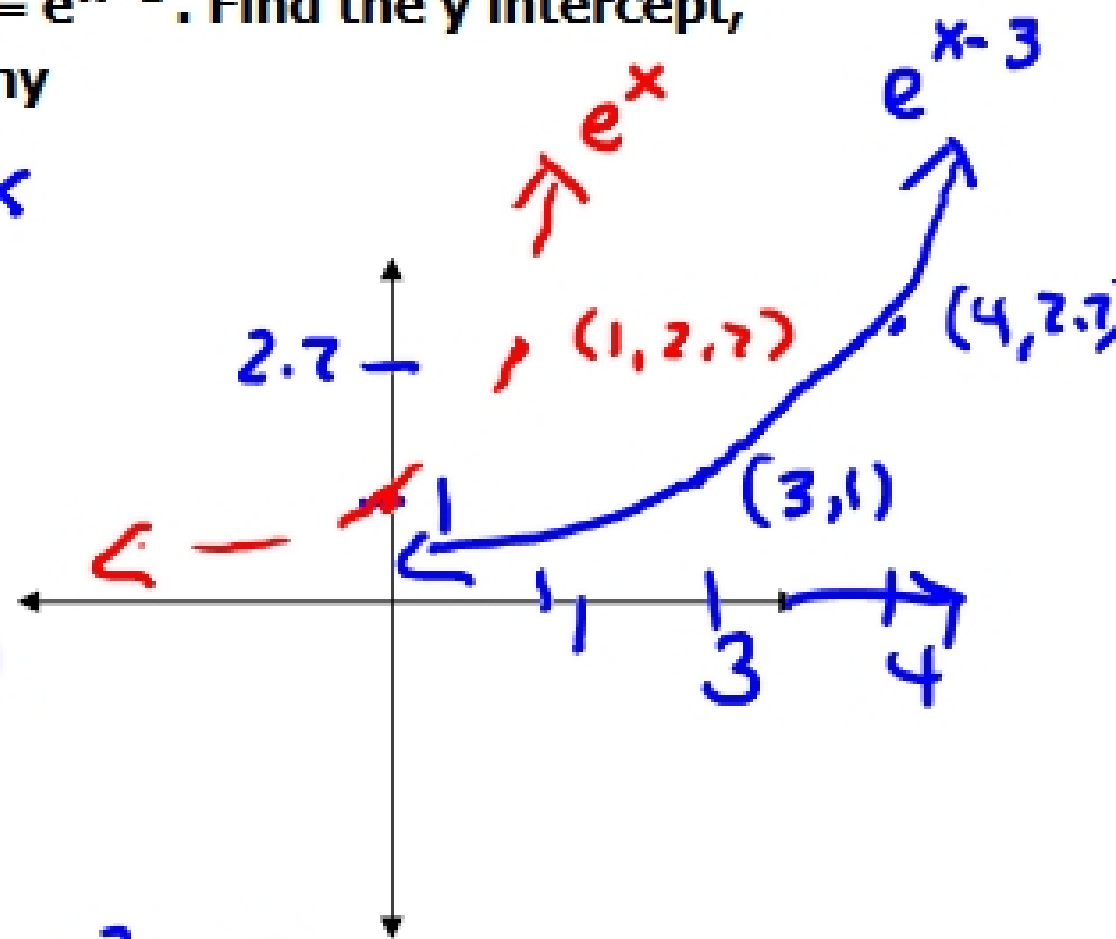
Sketch the graph of $f(x) = e^x - 1$. Find the y intercept, the domain, the range and any asymptotes. $e = 2.7$



Example 2:

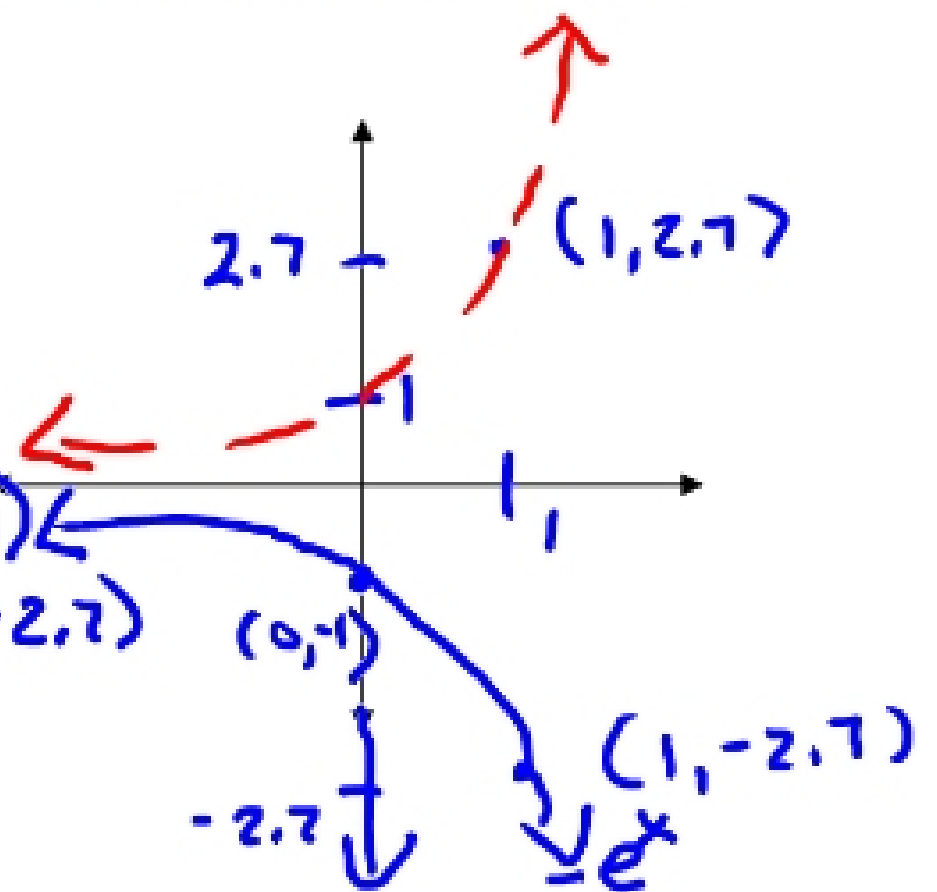
Sketch the graph of $f(x) = e^{x-3}$. Find the y intercept, the domain, the range and any asymptotes.

Basic graph $f(x) = e^x$
 $f(x) = e^{x-3}$
 Domain: $(-\infty, \infty)$
 $(0, 1) \rightarrow$ right 3 $\rightarrow (3, 1)$
 $(1, 2.7) \rightarrow$ right 3 $\rightarrow (4, 2.7)$
 HA: $y = 0$
 Range: $(0, \infty)$
 yint: $x = 0$ $e^{0-3} = e^{-3} = \frac{1}{e^3}$

**Example 3:**

Sketch the graph of $f(x) = -e^x$. Find the y intercept, the domain, the range and any asymptotes.

Basic $f(x) = e^x$
 $f(x) = -e^x$
 Domain: $(-\infty, \infty)$
 $(0, 1) \rightarrow$ x-axis reflect $\rightarrow (0, -1)$
 $(1, 2.7) \rightarrow$ x-axis reflect $\rightarrow (1, -2.7)$
 HA: $y = 0$
 Range: $(-\infty, 0)$
 yint: $x = 0$ $y = -e^0 = -1$ $(0, -1)$



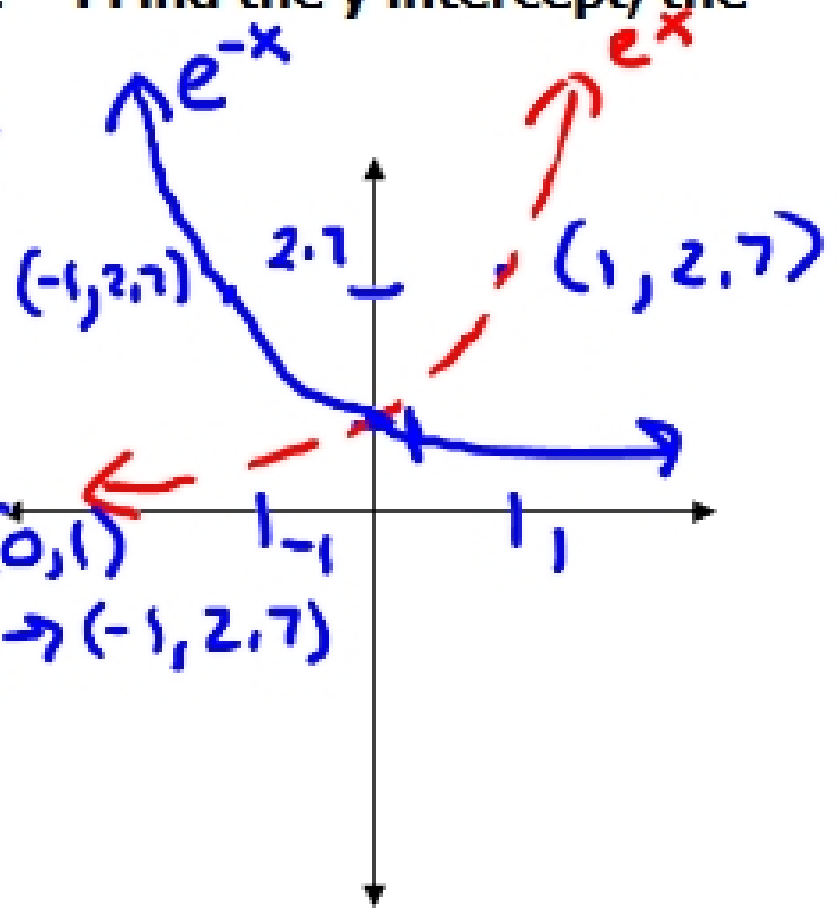
Example 4:

Sketch the graph of $f(x) = e^{-x}$. Find the y intercept, the domain, the range and any asymptotes.

Basic graph $f(x) = e^x$
 $f(x) = e^{-x}$
 Domain: $(-\infty, \infty)$

$(0, 1) \rightarrow$ y axis reflection $\rightarrow (0, 1)$
 $(1, 2.7) \rightarrow$ y axis reflection $\rightarrow (-1, 2.7)$

HA: $y = 0$
 Range: $(0, \infty)$
 yint: $(0, 1)$



Example 5:

Sketch the graph of $f(x) = e^{x-2} + 4$. Find the y intercept, the domain, the range and any asymptotes.

Basic $f(x) = e^x$
 $f(x) = e^{x-2} + 4$
 Domain: $(-\infty, \infty)$

$(0, 1) \rightarrow$ right 2, up 4 $\rightarrow (2, 5)$
 $(1, 2.7) \rightarrow$ right 2, up 4 $\rightarrow (3, 6.7)$

HA: $y = 4$
 Range: $(4, \infty)$
 yint: $x = 0$ $y = e^{0-2} + 4 = \frac{1}{e^2} + 4$

