San José State University
Fall 2015
Math-8: College Algebra
Section 03: MW noon–1:15pm
Section 05: MW 4:30–5:45pm

Quiz #14 (Solutions)

1. We saw in class that a^x for $x \in \mathbb{R}$ is the value that a^x approaches as we get closer and closer to x with a sequence of rational numbers. This works for the base as well. We were also introduced to the special base $e = 2.71828\ldots$, known as Euler's number. Calculate e^2 on your calculator and show how 2^2, 2.7^2, 2.71^2, $\ldots$ approaches e^2. Look at 6 such terms.

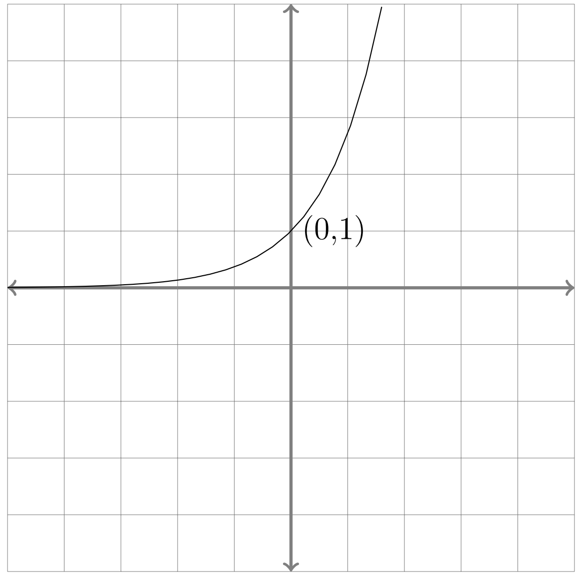
$$\begin{aligned} e &= 2.71828 \\ e^2 &= 7.38906 \end{aligned}$$

2	4
2.7	7.29
2.71	7.3441
2.718	7.38752
2.7182	7.38861
2.71828	7.38905

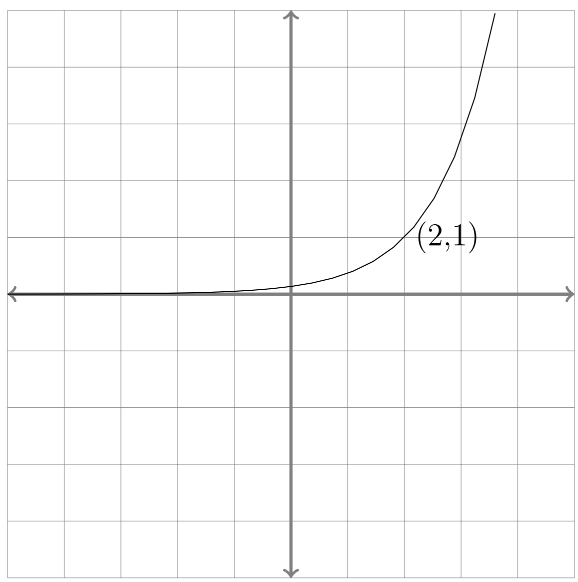
2. Sketch the graph: $y = e^{-x+2} + 1$. (Hint: factor out the negative in the exponent first).

$$y = e^{-(x-2)} + 1$$

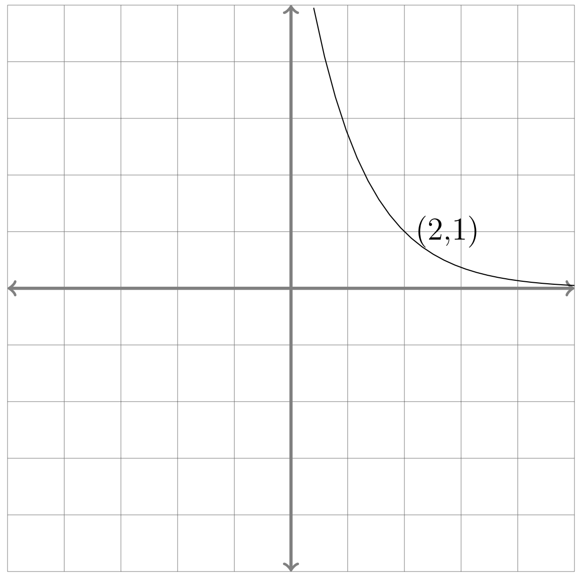
Start with the basic graph $y = e^x$.



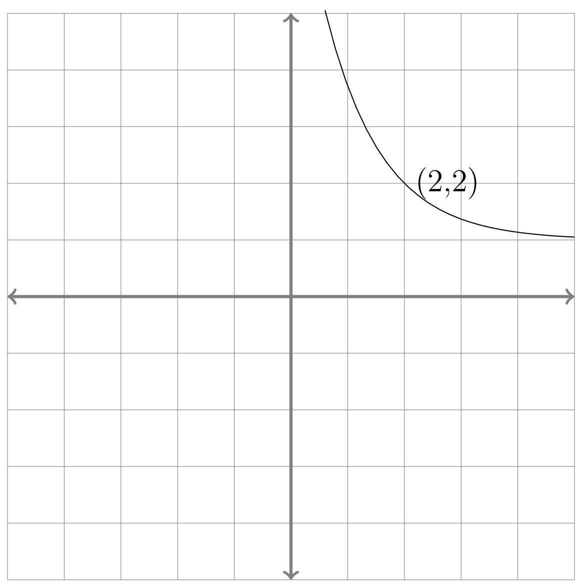
Translate right by 2.



Reflect across the x-axis.



Finally, translate up by 1.



3. Determine the amount of money in a savings account after 5 years at a yearly interest rate of 2% assuming that the original principle is \$10000 and the compounding rate is: a) monthly, and b) continuous.

a. n=12

$$A = 10000\left(1 + \frac{0.02}{12}\right)^{5\cdot 12} = \$11050.80$$

b. Continuous

$$A = 10000e^{0.02 \cdot 5} = \$11051.70$$

4. The half-life of Uranium-235 is about 700 million years. What percent of a sample is left after only 100 million years?

$$\frac{A}{A_0} = \left(\frac{1}{2}\right)^{\frac{100}{700}} = 0.906 = 90.6\%$$

5. Evaluate:

a. $\log_2 256 = 8$

b. $\log_{10} 10000 = 4$

c. $\ln 5 = 1.6094$

6. Solve:

a. $\log_3(x+1) = \log_3(13)$.

$$\begin{aligned} \log_3(x+1) &= \log_3(13) \\ x+1 &= 13 \\ x &= 12 \end{aligned}$$

Before we state the final answer we need to plug it back in to the original equation and make sure that no domains are violated, and indeed, everything is OK here. So, $x = 12$.

b. $10\log_7(7^{x-2}) = 5^{\log_5(2x-1)}$

$$\begin{aligned} 10\log_7(7^{x-2}) &= 5^{\log_5(2x-1)} \\ 10(x-2) &= 2x-1 \\ 10x-20 &= 2x-1 \\ 8x &= 19 \\ x &= \frac{19}{8} \end{aligned}$$

Thus, there is no solution.

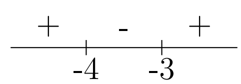
7. Determine the domain for $f(x) = \frac{\log_3(x^2+7x+12)}{\sqrt{x-1}}$

There are two domain issues that need to be checked: the *log* in the numerator and the square root in the denominator. For the *log* in the numerator, we must eliminate negative and zero values:

$$x^2 + 7x + 12 = (x+4)(x+3) > 0$$

So we have critical points -4 and -3. Using a sign table to check the intervals:

	(x+3)	(x+4)	
-5	$-$	$-$	$+$
-3.5	$-$	$+$	$-$
0	$+$	$+$	$+$



The resulting domain is $(-\infty, -4) \cup (-3, \infty)$. Note that we do not use the points -4 and -3, since *log* does not allow 0.

Now, the denominator requires that $x - 1 > 0$, or $x > 1$. The final domain is the intersection of these two regions. Note that the $x > 1$ dominates - nothing equal to or less than -1 is allowed due to the denominator. So the final answer is $(1, \infty)$.

Note that one of the limitations totally dominating the other is not always the case. Sometimes the intersection is more complicated, so don't assume.