Math-71 Sections 9, 11, 12

Homework #7 Solutions

Reading

Read sections 10.1 and 10.2.

Problems

1. Sketch the graph $y = -2\left(\frac{3}{2} - e^{3-x}\right)$ by:

   (a) Performing the necessary algebra so that the function is in the proper form (i.e., the transformations are in the proper order).

   $$y = 2e^{-(x-3)} - 3$$

   (b) Listing the transformations in the order that they are to be applied.

   0) Basic graph: $y = e^x$.

   1) Right by 3.

   2) Horizontal reflection.

   3) Vertical scale by 2.

   4) Down by 3.

   (c) Marking the key point and horizontal asymptote.

   0) $(0, 1)$

   1) $(3, 1)$

   2) $(3, 1)$

   3) $(3, 2)$

   4) $(3, -1)$

   KP: $(3, -1)$
   HA: $y = -3$

   (d) Calculating and marking all existing intercepts.

x-intercept:

$$0 = 2e^{-(x-3)} - 3$$
$$2e^{-(x-3)} = 3$$
$$e^{-(x-3)} = \frac{3}{2}$$
$$-(x-3) = \ln\left(\frac{3}{2}\right)$$
$$x - 3 = -\ln\left(\frac{3}{2}\right)$$
$$x = 3 - \ln\left(\frac{3}{2}\right)$$
$$x \approx 2.6$$

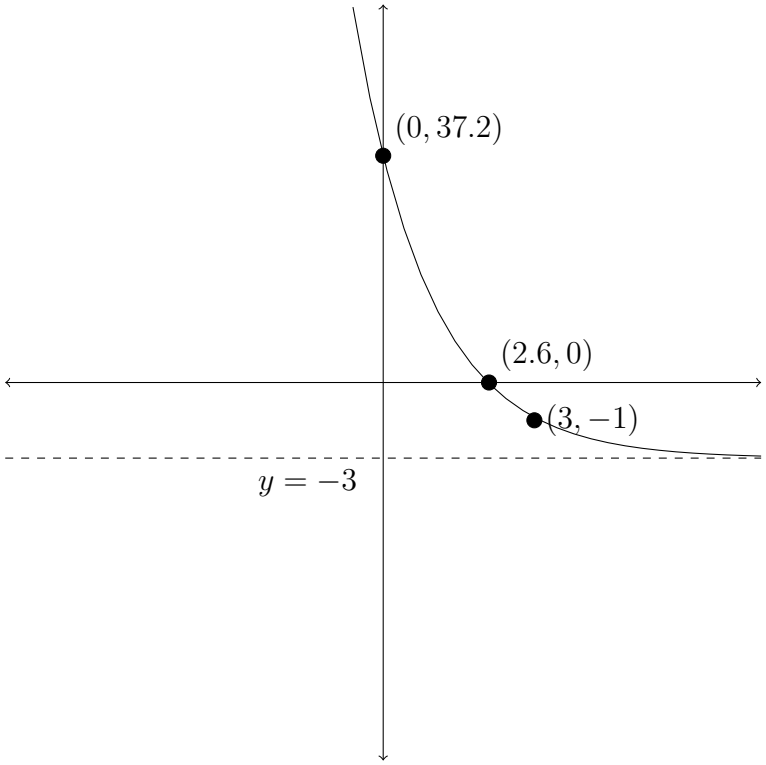
$$(2.6, 0)$$

x-intercept:

$$y = 2e^{-(0-3)} - 3 = 2e^3 - 3 = 37.2$$

$$(0, 37.2)$$

(e) Sketching the final graph.



2. You open a new savings account on April 1 with an initial $1000 at a local bank that pays 2% interest, compounded monthly on the last day of the month. You file the necessary direct deposit paperwork at you job, where you get paid monthly on the first of the month, so that $500 will be auto-deposited into your new account each month, starting with your May paycheck. In June, you withdraw $250 to pay for a new mobile phone. In July, you withdraw $750 to help pay for your summer vacation. There are no other transactions. What is your account balance on August 2?

   First, calculate the compounding factor:

   $$x = 1 + \frac{r}{n} = 1 + \frac{0.02}{12} = 1.001666667$$

   Note that there are lots of decimal places here, so store this result into a storage register on your calculator.

   Now, construct the transaction table:

month	deposit	withdrawal	net
Apr	1000		1000
May	500		500
Jun	500	250	250
Jul	500	750	-250
Aug	500		500

   Next, note that the first deposit compounds over 4 months, so we build the compounding polynomial as follows:

   $$1000x^4 + 500x^3 + 250x^2 - 250x + 500 = \$2009.60$$