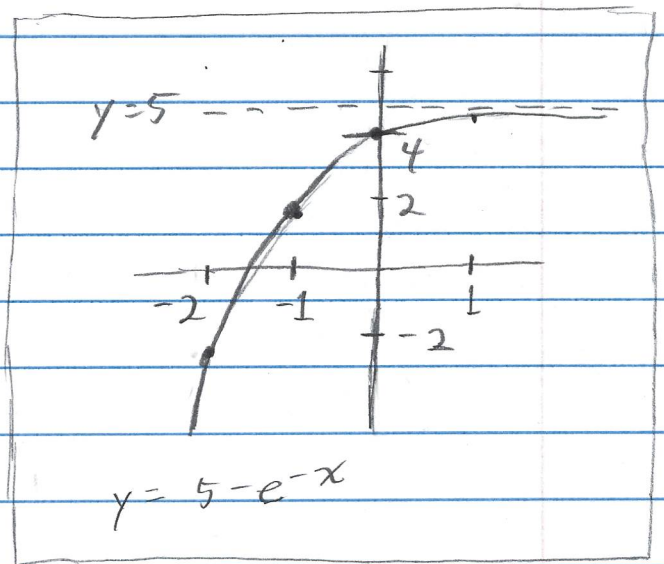
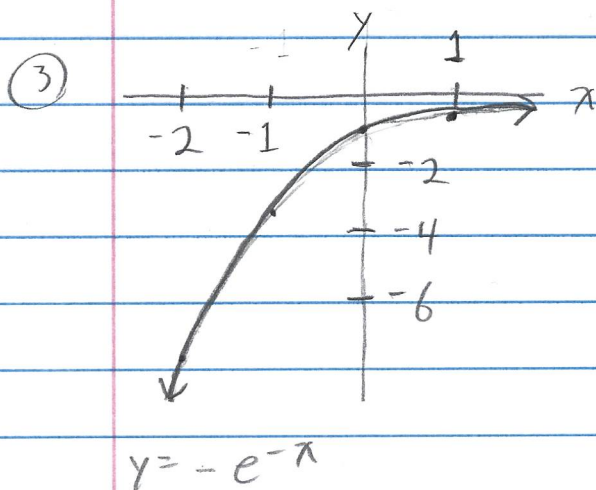
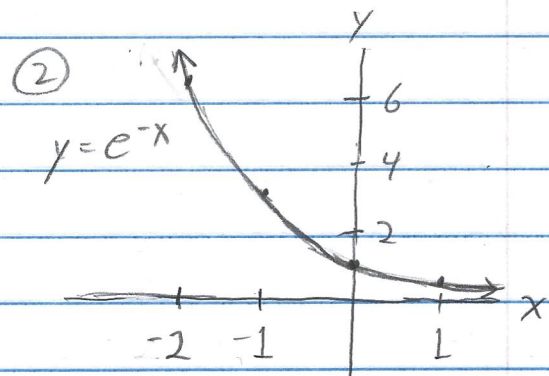
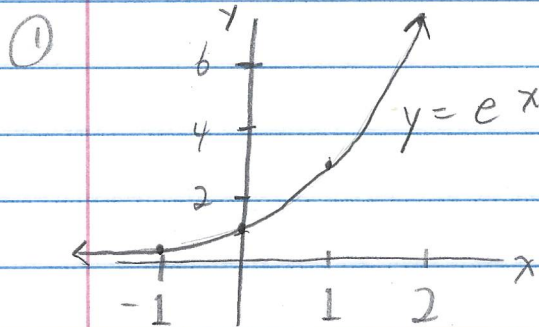


Exercise 5.3.61 Begin with the graph of  $y = e^x$  and use transformations to graph  $f(x) = 5 - e^{-x}$ . Determine the domain, range, horizontal asymptote, and  $y$ -intercept.

Solution

On  $y = e^x$ , first replace  $x$  with  $-x$  to get  $y = e^{-x}$  which is a reflection of  $y = e^x$  about the  $y$ -axis. Next multiply  $e^{-x}$  by  $-1$  to get  $y = -e^{-x}$ , which is a reflection of  $y = e^{-x}$  about the  $x$ -axis. Third, add 5 to  $-e^{-x}$  to get  $y = 5 - e^{-x}$  which is a vertical shift up by 5 units of  $y = -e^{-x}$ . So we have:



5.3.61  
continued

The domain is  $\mathbb{R} = (-\infty, \infty)$ , the range (from the graph) is  $(-\infty, 5)$ , the horizontal asymptote is  $y = 5$ , and the  $y$ -intercept is  $5 - e^{-10} = 5 - 1 = 4$ .

□