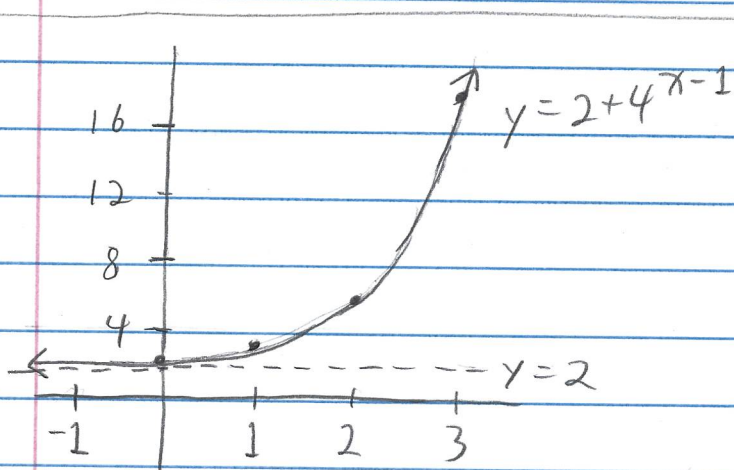
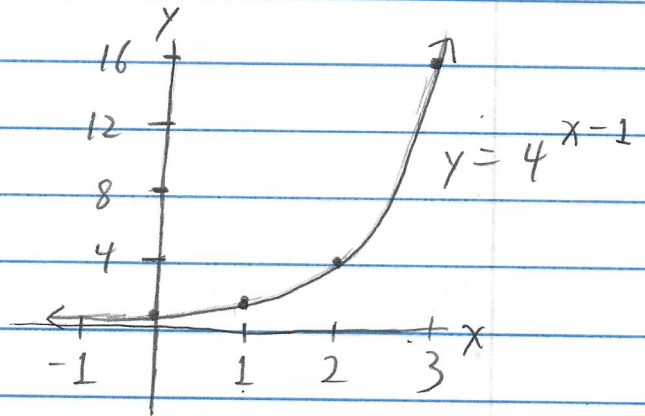
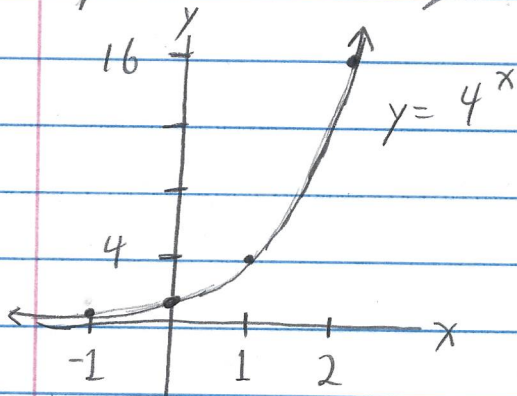


Exercise 5.3.53 Use transformations to graph $f(x) = 2 + 4^{x-1}$. Determine the domain, range, horizontal asymptote, and y -intercept.

Solution

We start with the graph of the exponential function $y = 4^x$. First, we replace x with $x-1$ which results in a horizontal shift to the right of 4^x by 1 unit. This gives $y = 4^{x-1}$. Second we add 2 to 4^{x-1} which results in a vertical shift up by 2 units of 4^{x-1} to get $y = 2 + 4^{x-1}$. So we have:



The domain is $\mathbb{R} = (-\infty, \infty)$, the range (from the graph) is $(2, \infty)$, the horizontal asymptote is $y = 2$, and the y -intercept is $2 + 4^{-1} = 2 + \frac{1}{4} = \frac{9}{4}$.

□