Recall: A bacteria colony C has population $C(t)$, where t is measured in hours since the colony was established. The formulas for this function is

$$C(t) = 100 \cdot e^{2t}$$

d. [3 points] Find a formula for $g(P)$, a function that gives the amount of time (in hours) it takes for colony C to reach P bacteria.

Solution: We are being asked to find $C^{-1}(P)$. We do this by solving $P = C(t)$ for t:

$$\begin{aligned} P &= 100e^{2t} \\ P/100 &= e^{2t} \\ \ln(P/100) &= 2t \\ t &= \frac{1}{2}\ln(P/100) \end{aligned}$$

Answer: $g(P) =$ $\frac{1}{2}\ln(P/100)$

4. [7 points] Let $g(x) = 2 \cdot (0.5)^{-3x} - 6$.

a. [5 points] List the transformations you need to apply to the graph of $y = 0.5^x$ to transform it to that of $y = g(x)$. Fill each space with either a number or one of the phrases below, as appropriate. (Leave the second blank empty for reflections.)

Solution: One note: the only order here that matters is that the vertical stretch happens before the shift down.

First, **reflect it across the y-axis** by ______

then, **Compress it horizontally** by 1/3

then, **stretch it vertically** by **2**

then, **shift it down** by **6**

b. [2 points] Give equations for all vertical and horizontal asymptotes of $g(x)$. If there are none, write None.

Answer: Vertical Asymptotes: **None**

Answer: Horizontal Asymptotes: $y = -6$