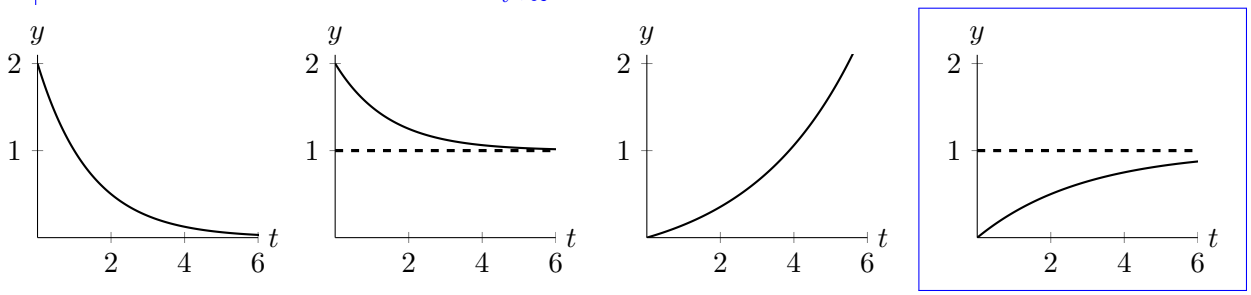
4. [12 points] Nash the dog loves to eat. The amount of food, in pounds, that Nash has consumed t seconds after the start of a meal can be modeled by the function

$$N(t) = 1 - 2^{-0.5t}.$$

a. [2 points] Circle the one graph that could be the graph of $y = N(t)$.

Solution: Note that $N(0) = 0$ and $\lim_{t\to\infty} N(t) = 1$.



b. [6 points] Find a sequence of transformations you could apply to the function 2^t to transform it into $N(t)$. For each transformation, fill in the first blank with one of the options listed below. In the second blank, include the amount of any shift, or the scaling factor for any stretch or compression. For reflections, write N/A.

HORIZONTAL / VERTICAL REFLECTION
STRETCH IT HORIZONTALLY / VERTICALLY
COMPRESS IT HORIZONTALLY / VERTICALLY
SHIFT IT LEFT / RIGHT / UP /DOWN

First, **horizontal reflection** by **N/A**.

Then, **vertical reflection** by **N/A**.

Then, **horizontal stretch** by **2**.

Then, **shift up** by **1**.

Solution: Note that any order of these transformations in which the vertical reflection occurs before the shift up is also correct.

c. [4 points] Let $F(m)$ denote the number of pounds of food Nash has consumed m **minutes** after the start of a meal.

i. Find an implicit formula for $F(m)$. That is, find a formula for $F(m)$ in terms of the function N.

Answer: $F(m) =$ $N(60m)$

ii. Now find an explicit formula for $F(m)$. That is, find a formula for $F(m)$ that does *not* use the function N.

Answer: $F(m) =$ $1 - 2^{-0.5(60m)}$ **or** $1 - 2^{-30m}$