3. [5 points] The function $y(t)$, given to the right, gives the mass, in milligrams, of a yeast colony t hours after an experiment begins, where A, B, and C are constants.

$$y(t) = \begin{cases} \dfrac{A}{1+e^{-Ct}} & 0 \le t < 4 \\ \\ 12B^t & t \ge 4 \end{cases}$$

Find the values of A, B, and C such that all of the following hold:

- $\lim\limits_{t \to 0^+} y(t) = 8$,
- the yeast colony's mass decays by 2% each hour after $t = 4$, and
- $y(t)$ is continuous at $t = 4$.

Show your work, and give your answers in **exact form**.

Answers: $A =$ _____ $B =$ _____ $C =$ _____

4. [7 points] Consider the rational function $r(x) = \dfrac{x(x-1)(x+4)^2}{(x^2-1)(x+4)}$.

a. [5 points]

i. Find the equations of any horizontal asymptotes of $r(x)$ or write NONE if there are none.

Answer: _____

ii. Find all the zeros of $r(x)$, or write NONE if there are none.

Answer: _____

iii. Find all numbers c such that the limit $\lim\limits_{x \to c} r(x)$ exists but $r(c)$ is *not* defined.

Answer: _____

b. [2 points] Find a linear function $h(x)$ such that the function $r(x) \cdot h(x)$ has no vertical asymptotes.

Answer: $h(x) =$ _____