

5. [11 points] In both parts of this problem, you should **show your work**, and make sure your answers are **exact** and written *in the spaces provided*.
- a. [6 points] Kayla was cultivating a strain of bacteria in her lab, and noticed that the mass of her bacterial culture was growing exponentially. She started the experiment at 9 a.m. and ended it at 5 p.m., at which point she had 234 grams of bacteria. Find a formula expressing the mass of her culture  $m(t)$  (in grams) as a function of the time  $t$ , measured in hours after 9 a.m., given that the mass of her culture was 20 grams at noon.

$$m(t) = \underline{\hspace{10em}}$$

- b. [5 points] A 10 liter bottle is filled completely with a combination of oil and vinegar. Each kilogram of oil takes up 1.25 liters, while each kilogram of vinegar takes up 1 liter. Let  $N(\ell)$  be the amount of vinegar (measured in kilograms) in the bottle when it is filled with  $\ell$  kilograms of oil. Find a formula for  $N(\ell)$  in terms of  $\ell$  and indicate the domain on which your formula is valid. *Note: there are practical considerations for your domain in this problem.*

$$N(\ell) = \underline{\hspace{10em}}, \text{ with domain } \underline{\hspace{10em}}$$