

5. [11 points] Monica has decided to buy a restaurant that costs \$35,000. She gives \$3,600 to Chandler and asks him to find the best way to invest it, so that she will be able to buy the restaurant in at most 2 years. Chandler invests the money for Monica in a certain cryptocurrency, and the value of Monica’s investment grows by exactly 10% each month. Let $G(m)$ be the value of Monica’s investment (in \$) after m months.

a. [4 points] Find a formula for the function $G(m)$.

$$G(m) = \frac{3600(1.1)^m}{\hspace{10em}}$$

- b. [3 points] Is Monica going to be able to buy the restaurant by the end of the 2 years? Circle your answer. Briefly justify your answer.

YES NO CANNOT BE DETERMINED

Solution: $G(24) = 3600(1.1)^{24} \approx 35459.037 > 35000$.
 The value of Monica’s investment will be greater than 35000 by the end of the 2 years.

- c. [4 points] The owner of the restaurant decides to increase the price to \$40,000. If Monica started with the same \$3,600 initial investment, what should the minimum monthly growth rate be for Monica’s investment in order for her to be able to buy the restaurant in 2 years? Show all your work, and give your answer in **exact** form.

Solution:

$$\begin{aligned}
 3600(1+r)^{24} &= 40000 \\
 (1+r)^{24} &= \frac{40000}{3600} \\
 (1+r)^{24} &= \frac{100}{9} \\
 1+r &= \sqrt[24]{\frac{100}{9}} \\
 r &= \sqrt[24]{\frac{100}{9}} - 1
 \end{aligned}$$