

2. [11 points] Invasive beetles were accidentally introduced to a nature preserve, and their population then grew exponentially for 11 weeks. In particular, the number of beetles in the preserve  $t$  weeks after their introduction was modeled by the function

$$b(t) = 4(1.5)^t \text{ for } 0 \leq t < 11.$$

Show your work and give answers in exact form or rounded to at least two decimal places unless otherwise noted.

- a. [3 points] By what percent did the beetle population grow each day?

**Answer:** \_\_\_\_\_ %

- b. [3 points] At what time  $t$  was the number of beetles equal to 100?

**Answer:**  $t =$  \_\_\_\_\_

- c. [5 points] The beetle was detected and, after 11 weeks, eradication efforts began. From that time, the population decreased at a rate of 50 beetles per week until the population was completely removed.

- i. How many beetles were there after 11 weeks?

*You may round your answer to the nearest whole beetle.*

**Answer:** \_\_\_\_\_ beetles

- ii. From the time the beetle population was introduced to the preserve, how many weeks passed before it was completely removed?

**Answer:** \_\_\_\_\_ weeks

- iii. Use your answers to complete the piecewise formula given below for the beetle population  $b(t)$  from when it was first introduced to the preserve until the time it was completely removed.

$$\text{Answer: } b(t) = \begin{cases} 4(1.5)^t & 0 \leq t < 11 \\ \text{_____} & \text{_____} \leq t \leq \text{_____} \end{cases}$$