Unit 2 Practice Problems

1. A culture of bacteria grows by 40% ← 0.40 each hour. Write an exponential growth model for the population P(t) after t hours if the initial population is 500. ← P_0

   $P(t) = P_0 (1 + r)^t$ $P(t) = 500 (1 + 0.40)^t \rightarrow P(t) = 500 (1.4)^t$

2. Describe how the graph of $y = log_{10}x$ is transformed to obtain $y = 2log_{10}(x - 4) + 1$. List shift, stretch/compression, and reflecion if any.

   X-4 → horizontal shift, right 4 units   vertical stretch by 2
   +1 → vertical shift, up 1

3. Solve for x: $log_2(x + 3) = 4$

   $log_a(b) = c \rightleftharpoons a^c = b$

   $2^4 = x + 3$ $16 = x + 3$
                          $-3 \quad\quad -3$
   $16 = x + 3$ ⟶ $x = 13$

4. A radioactive substance has a half-life of 8 years. If the initial mass is 100 grams, write the decay model and find the mass after 20 years.

   $A(t) = A_0 (½)^{t/h}$ $A(20) = 100 (0.5)^{20/8}$ $20/8 = 2.5$
   $A(t) = 100 (0.5)^{t/8}$ $A(20) = 100 (0.5)^{2.5}$ $A(20) \approx 17.68$
                                   $A(20) = 100 \cdot (0.1767767)$ grams

5. Rewrite the exponential equation $y = 3^{x+2}$ in logarithmic form.

   $log_a(b) = c \rightleftharpoons a^c = b$

   $log_3 y = x + 2$