Answer Question #46698 – Math – Algebra

If there are initially 2,200 bacteria in a culture and the number of bacteria triples each hour, the number of bacteria after t hours can be found using the formula $y = 2200(3^t)$. How long will it take the culture to grow to 60,000 bacteria?

Solution:

Many processes that occur in nature, such as population growth, radioactive decay, heat diffusion, and numerous others, can be modeled using exponential functions. In our case we have deal with exponential growth of bacteria in a culture, we know that number of bacteria triple each hour and also we know the formula of number of bacteria after t hours. We need to solve the equation y(t) = 60,000 for time t, which leads to the exponential equation. We substitute the given value into the original formula.

$$2200(3^t) = 60\,000$$

We use the procedure for solving exponential equations.

$$3^t = \frac{60000}{2200}$$

We apply the power Rule of Logarithms.

$$\log 3^t = \log \frac{60000}{2200}$$

Now we can rewrite the obtained equation.

$$\log \frac{60000}{2200} = t \log 3$$

Then we can find the value of t.

$$t = \frac{\log \frac{60000}{2200}}{\log 3} = \frac{1.435729}{0.477121}$$

Finally we obtained the value of t.

$$t \approx 3.009 \text{ hour.}$$

Answer: The number of bacteria will reach to 60,000 in approximately 3.01 hours.