Name _____ Date _____

1. Use properties of exponents to explain why it makes sense to define $16^{\frac{1}{4}}$ as $\sqrt[4]{16}$.

2. Use properties of exponents to rewrite each expression as either an integer or as a quotient of integers $\frac{p}{q}$ to show the expression is a rational number.

   a. $\sqrt[4]{2}\,\sqrt[4]{8}$

   b. $\frac{\sqrt[3]{54}}{\sqrt[3]{2}}$

c. $16^{\frac{3}{2}} \cdot \left(\frac{1}{27}\right)^{\frac{2}{3}}$

5. A scientist is studying the growth of a population of bacteria. At the beginning of her study, she has 800 bacteria. She notices that the population is quadrupling every hour.

   a. What quantities, including units, need to be identified to further investigate the growth of this bacteria population?

   b. The scientist recorded the following information in her notebook, but she forgot to label each row. Label each row to show what quantities, including appropriate units, are represented by the numbers in the table, and then complete the table.

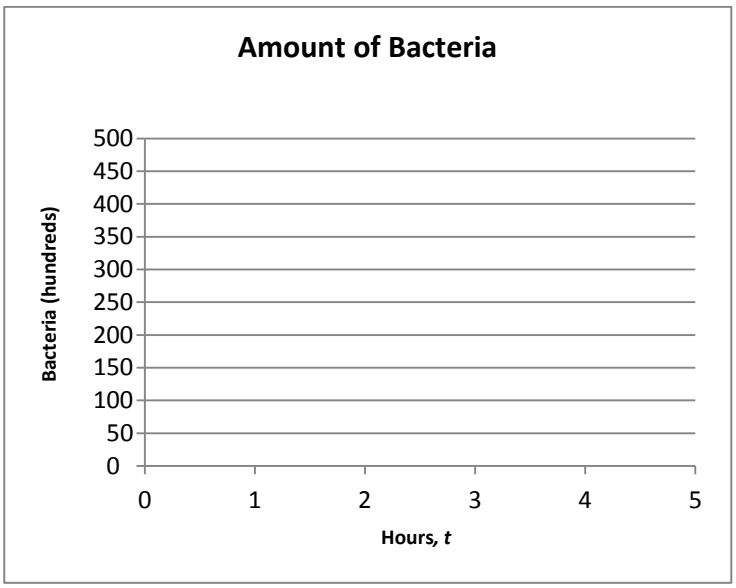
	0	1	2	3	4
	8	32	128		

c. Write an explicit formula for the number of bacteria present after t hours.

d. Another scientist studying the same population notices that the population is doubling every half an hour. Complete the table, and write an explicit formula for the number of bacteria present after x half hours.

Time, t (hours)	0	$\frac{1}{2}$	1	$\frac{3}{2}$	2	$\frac{5}{2}$	3
Time, x (half hours)	0	1	2	3	4	5	6
Bacteria (hundreds)	8	16	32				

e.



f. A scientist calculated the average rate of change for the bacteria in the first three hours to be 168. Which units should the scientist use when reporting this number? Explain how you know.

Find the time, in hours, when there will be 5,120,000 bacteria. Express your answer as a logarithmic expression.