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Chapter 3 Practice Test

For questions 1 to 5, select the best answer.

1. The number of cells in a bacteria colony doubles every week. If N represents the number of cells in the colony, N_o represents the number of cells at the start, and t represents the time, in days, then the expression that describes the situation is

A $N = N_o(2)^t$
B $N = 2(N_o)^t$
C $N_o = N(2)^t$
D $N_o = 2(N)^t$

2. Compared to $y = 4^x$, the graph of $y = 4^{x-1}$ is translated

A 1 unit to the left
B 1 unit to the right
C 1 unit up
D 1 unit down

3. The range for the function $y = \frac{1}{2}(3)^x - 2$ is

A $\{x \in \mathbb{R}\}$
B $\{x \in \mathbb{R}, x > -2\}$
C $\{y \in \mathbb{R}, y > 2\}$
D $\{y \in \mathbb{R}, y > -2\}$

4. When simplified, the value of the expression $\left(\frac{1}{16}\right)^{-\frac{3}{4}}$ is

A $\frac{1}{8}$
B $\frac{1}{16}$
C 8
D 16

5. The graph of $y = 4^x$ compared to the graph of $y = 2^{2x}$ would

A be a vertical stretch
B be a horizontal stretch
C be translated to the right
D be the same

6. Evaluate. Express your answers using only positive exponents.

a) $\left(\frac{1}{4}\right)^{-\frac{5}{2}}$

b) $\left(\frac{1}{2}\right)^{0} + \left(\frac{1}{2}\right)^{-1} + \left(\frac{1}{2}\right)^{-2}$

c) $\left(-(-3)^2\right)^{-1}$

d) $\left(\frac{4}{9}\right)^{-\frac{3}{2}} + \left(\frac{1}{25}\right)^{-\frac{1}{2}}$

7. Simplify. Express your answers using only positive exponents.

a) $\left(x^{\frac{3}{2}}y^{-2}\right)^{-2}$

b) $\left(2v^{-2}w^2\right)^{-3}\left(4v^2w^2\right)^3$

c) $\left(\frac{a^2b^3}{3}\right)^{-1} \times \left(\frac{4}{a^{-1}b^3}\right)^2$

d) $\sqrt[3]{27u^3v^{-6}}$

8. Describe the transformations of the function $y = 2^x$ that are needed to generate the function $y = 2\left(\frac{1}{2}\right)^{x+1} + 2$.

9. The population of a developing city increases by 8% per year. In 2005, 125 000 people lived in the city.

a) Model the population as an exponential function, using $t = 0$ to represent the year 2005.
b) Graph the function for $t = 0$ to $t = 20$.
c) What is the population expected in 2020?
d) In what year should the population reach half a million?
e) What assumptions are made in order to answer parts c) and d)?

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10. To calculate interest, a financial institution uses the formula $A = P\left(1 + \frac{i}{N}\right)^{n \times N}$, where A represents the current amount, in dollars, of the investment; P is the principal invested; i is the annual interest rate, expressed as a decimal; N is the number of interest payments per year; and n represents the number of years of the investment.

a) Rewrite the formula to express the principal amount, P, as a function of A, the amount invested.

b) An account with a current balance of $3590 has earned interest for 3 years at the rate of 6% per year, compounded monthly. What is the original amount of the principal invested?

11. The formula for the surface area, S, of a cylinder is $S = 2\pi r^2 + 2\pi rh$, where h is the height of the cylinder and r is the radius.

a) Rewrite this formula to express the height as a function of the surface area and radius of the cylinder.

b) Rewrite the expression from part a) in another way.

c) If the surface area of the cylinder is 503 cm^2 and the diameter is 10 cm, what is the height of the cylinder?

12. The table shows data collected by scientists studying the polar bear population in a remote area of the Arctic.

Year	Population
2000	825
2001	883
2002	945
2003	1011
2004	1081
2005	1157
2006	1238
2007	1325

a) Modify this table of values such that $t = 0$ represents the year 2000.

b) Make a scatter plot of the data.

c) Do the data appear to be exponential in nature? Explain.

d) Find the equation of the curve of best fit.

e) Use this equation to determine the polar bear population expected in 2012.

f) How long will it take the population to reach 4500, assuming the pattern of growth continues?

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