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Chapter 6 Practice Test

For questions 1 to 4, select the best answer.

1. Which value is equal to $(5^{-6})(5^3)$?

A -125

B -5^3

C $\frac{1}{125}$

D 5^{-18}

2. Which value is equal to $(-16)^{\frac{3}{4}}$?

A -12

B -8

C 8

D None of these. The expression cannot be evaluated.

3. Which expression is equal to 3^4?

A $\sqrt[4]{3}$

B $\sqrt[4]{81}$

C 12

D 9^2

4. What is the value of $x^{-3} \times x^5$ when $x = -4$?

A 16

B 65 536

C $-65\,536$

D $\frac{1}{16}$

5. Write each power as a power with base 4.

a) 16^2 **b)** 64^3

c) 2^{10} **d)** 32^0

6. Simplify, then evaluate. Give your answer as a whole number or a fraction.

a) $4^{-5} \times 4^6 \times 4^2$

b) $\frac{(5^{-1})(5^4)}{5^{-2}}$

c) $(a^3b^{-1})^{-2}$, for $a = 2$ and $b = -3$

d) $\frac{m^4n^{-5}}{m^3n^{-2}}$, for $m = -3$ and $n = 2$

e) $v^4 \times (v^{-2}w^{-3})$, for $v = 5$ and $w = 2$

7. Solve for x. Check your solution.

a) $16^3 = 4^{3x}$ **b)** $81^9 = 27^{2x}$

c) $4^{2(x+2)} = 32^{x-2}$

8. Evaluate.

a) $16^{\frac{1}{4}}$ **b)** $1\,000\,000^{\frac{1}{3}}$

c) $32^{\frac{4}{5}}$ **d)** $\left(-\frac{1}{8}\right)^{\frac{5}{3}}$

9. Evaluate, if possible. If not possible, explain why.

a) $(-9)^{\frac{3}{2}}$ **b)** $(-27)^{\frac{2}{3}}$

c) $\sqrt[3]{-125}$

10. Use a calculator to evaluate to three decimal places.

a) $214^{\frac{1}{4}}$ **b)** $19^{\frac{3}{2}}$

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11. Consider these two investment options.

Option A: \$1000 invested at 4.8% per year, compounded annually. The amount, A, after n years is given by the equation $A = 1000(1.048)^n$.

Option B: \$900 invested at 6.4% per year, compounded annually. The amount, A, after n years is given by the equation $A = 900(1.064)^n$.

a) Graph both equations on the same set of axes. What types of relations are these? How do you know?

b) Which investment has the greater future value? Explain your answer.

12. The equation $\text{S.A.} = 4\pi\left(\frac{3V}{4\pi}\right)^{\frac{2}{3}}$ relates the surface area, S.A., of a sphere to its volume, V. Determine the surface area of a sphere with volume 450 cm^3.

13. For each situation, state which type of model—linear, quadratic, exponential, or none of these—is most appropriate. Explain your choice.

a) The value of a vehicle, purchased for \$28 000, decreases by 8% per year. How is the value of the vehicle related to the number of years since the purchase?

b) The amount of a radioactive substance decreases by half every day. How is the amount of the substance related to time?

c) David buys two new books each month. How is the number of books David owns related to time?

14. Thorium is a naturally occurring element that can be found in soil, rocks, surface water, plants, and animals in low concentration. Humans can obtain thorium by consuming water, plants, or animals that have thorium, or inhaling it. Its biological half-life—that is, the rate at which it decays in the body—varies depending on where it is concentrated. If its isotope Thorium-230 (Th-230) is found in the liver, then the half-life of Th-230 is approximately 2 years.

a) Complete the table for an initial amount of 370 units of tritium.

Time (years)	Units Remaining
0	370
2	
4	
6	
8	
10	

b) Calculate the first and second differences. Is this relation linear or non-linear? Explain.

c) Calculate the common ratios. Is the relation exponential? Explain.

d) Determine an equation for the line or curve of best fit.

e) How long will it take for the initial amount of Th-230 to decay to 1 unit?

15. The number of bacteria, a in a culture, triples every hour. A culture of another bacteria was started 3 h later. The number of bacteria, b, in this culture doubles every hour. The equations representing these cultures are $a = 3^t$ and $b = 2^{t-3}$, where t is the time since the first culture was started. How long after the first culture is started will the two cultures have the same number of bacteria?

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