

Unit 6 Review

Exponential Ratios

Topics:

- Linear, Quadratic and Exponential Functions
- Exponent Laws
- Fractional Exponent Laws
- Properties of Exponential Graphs
- Exponential Transformations
- Exponential Growth and Decay
- Solving Exponential Equations

Nelson Page 408 #s 1 - 4, 27 & 28



Solutions

1. Which of the following expressions has a value of -7 ?

a) $25^{\frac{1}{2}} + 16^{\frac{1}{4}}$

b) $8^{\frac{2}{3}} - 81^{\frac{3}{4}} + 4^2$

c) $8^{-\frac{3}{4}} - 81^{-\frac{1}{4}} + 8^{-3}$

d) $81^{-\frac{3}{4}} + 16^{-\frac{3}{4}} - 16^{-\frac{1}{2}}$

$$\begin{aligned}
 25^{\frac{1}{2}} + 16^{\frac{1}{4}} &= \sqrt{25} + \sqrt[4]{16} = 5 + 2 = 7 \\
 8^{\frac{2}{3}} - 81^{\frac{3}{4}} + 4^2 &= (\sqrt[3]{8})^2 - (\sqrt[4]{81})^3 + 16 \\
 &= (2)^2 - (3)^3 + 16 \\
 &= 4 - 27 + 16 = -7
 \end{aligned}$$

$$\begin{aligned}
 8^{-\frac{3}{4}} - 81^{-\frac{1}{4}} + 8^{-3} &= \frac{1}{8^{\frac{3}{4}}} - \frac{1}{81^{\frac{1}{4}}} + \frac{1}{8^3} \\
 &= \left(\sqrt[4]{\frac{1}{8}}\right)^3 - \left(\sqrt[4]{\frac{1}{81}}\right) + \left(\frac{1}{8}\right)^3 \\
 &= \left(\sqrt[4]{\frac{1}{8}}\right)^3 - \left(\sqrt[4]{\frac{1}{81}}\right) + \left(\frac{1}{8}\right)^3 \\
 &= 4.75 \dots - \frac{1}{27} + \frac{1}{516} \neq -7
 \end{aligned}$$

$$\begin{aligned}
 81^{-\frac{3}{4}} + 16^{-\frac{3}{4}} - 16^{-\frac{1}{2}} &= \left(\sqrt[4]{\frac{1}{81}}\right)^3 + \left(\sqrt[4]{\frac{1}{16}}\right)^3 - \sqrt{\frac{1}{16}} \\
 &= \left(\frac{1}{3}\right)^3 + \left(\frac{1}{2}\right)^3 - \frac{1}{4} \\
 &= \frac{1}{27} + \frac{1}{8} - \frac{1}{4} \neq -7
 \end{aligned}$$

2. Identify the expressions that are true when $x = 2$.

a) $3^{2x-1} = 27$

b) $6^{2x-3} = \sqrt{6}$

c) $5^{3x+2} = \frac{1}{5}$

d) $(2^{2x})(2^{x-1}) = 32$

$3^{2(2)-1} = 27$

$3^{4-1} = 27$

$3^3 = 27$ ✓

$5^{3(2)+2} = \frac{1}{5}$

$5^{6+2} = \frac{1}{5}$

$5^8 = \frac{1}{5}$ ✗

$6^{2(2)-3} = \sqrt{6}$

$6^{4-3} = \sqrt{6}$

$6^1 = \sqrt{6}$ ✗

$(2^{2(2)})(2^{2-1}) = 32$

$(2^4)(2^1) = 32$

$2^{4+1} = 32$

$2^5 = 32$ ✓

3. Identify the expression that simplifies to 1.

a) $(a^{10+2p})(a^{-p-8})$

b) $(2x^2)^{3-2m} \left(\frac{1}{x}\right)^{2m}$

c) $[(c)^{2n-3m}](c^3)^m \div (c^2)^n$

d) $\left[(x^{4n-m})\left(\frac{1}{x}\right)\right]^6$

$a^{10+2p+(-p-8)}$

$= a^{10+2p-p-8}$

$= a^{p+2}$ ✗

$2x^{2(3-2m)}x^{-(2m)}$

$= 2x^{6-4m-2m}$

$= 2x^{6-6m}$ ✗

$c^{2n-3m+3(m)-2(n)}$

$= c^{2n-3m+3m-2n}$

$= c^0$

$= 1$

$\left[(x^{4n-m})(x^{-1})\right]^6$

$= (x^{4n-m-1})^6$

$= x^{24n-6m-6}$ ✗

4. The population of a town is growing at an average rate of 5% per year. In 2000, its population was 15 000. What is the best estimate of the population in 2020 if the town continues to grow at this rate?

- a) 40 000 c) 35 000
b) 30 000 d) 45 000

$$A = 15000(1.05)^{20}$$

$$A = 39799.47$$

$$A \approx 40000$$

$$A = A_0(b)^n$$

$$A_0 = 15000$$

$$b = 1.05$$

$$n = 2020 - 2000$$

$$= 20$$

$$A = ?$$

27. $\left(\left(\frac{1}{a}\right)\left(\frac{1}{b^{-1}}\right)\right)^{-1}$ is equivalent to a) $\frac{a}{b}$ b) $\frac{b}{a}$ c) $\frac{-a}{b}$ d) $\frac{-b}{a}$

$$= \left(\left(\frac{1}{a}\right)\left(\frac{b}{1}\right)\right)^{-1}$$

$$= \left(\frac{b}{a}\right)^{-1}$$

$$= \frac{a}{b}$$

28. If $3x^{\frac{1}{2}} = 12$, then x is equal to

a) 576

b) 64

c) 16

d) $\frac{1}{64}$

$$\frac{3x^{\frac{1}{2}}}{3} = \frac{12}{3}$$

$$x^{\frac{1}{2}} = 4$$

$$\sqrt{x} = 4$$

$$x = 4^2$$

$$x = 16$$