Unit 3 Review

Tuesday, June 6, 2023 10:41 AM

Unit 3 – Final Exam Review
Exponents and Powers

Powers with rational exponents :

$$x^{\frac{m}{n}} = \sqrt[n]{x^m} \quad \text{or} \quad \left(\sqrt[n]{x}\right)^m$$

Example: Write in radical form.

a) $35^{\frac{1}{2}}$ $\quad$ or $\sqrt[2]{35^1}$ $\quad$ or $\sqrt{35}$

b) $90^{0.2}$ $\quad \frac{0.2 \times 10}{1 \times 10} = \frac{2}{10} = \frac{1}{5}$ $\quad 90^{\frac{1}{5}} = \sqrt[5]{90^1} = \sqrt[5]{90}$

c) $18^{\frac{6}{5}}$ $\quad \sqrt[5]{18^6}$ or $\left(\sqrt[5]{18}\right)^6$

d) $\left(\frac{4}{9}\right)^{\frac{2}{3}}$ $\quad \left(\sqrt[3]{\frac{4}{9}}\right)^2$ or $\sqrt[3]{\left(\frac{4}{9}\right)^2}$

Example: Write each radical as an exponent.

a) $\sqrt[2]{21^1}$ $\quad 21^{\frac{1}{2}}$

b) $\sqrt[3]{44}$ $\quad 44^{\frac{1}{3}}$

c) $\left(\sqrt[5]{80}\right)^2$ $\quad 80^{\frac{2}{5}}$

d) $\sqrt[3]{\left(\frac{4}{9}\right)^5}$ $\quad \left(\frac{4}{9}\right)^{\frac{5}{3}}$

Powers that have a negative exponent

$$x^{-n} = \frac{1}{x^n}$$

Rational numbers with negative powers

$$\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$$

Example: Evaluate each power with positive exponents (without a calculator)

a) 4^{-2}

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

$= \frac{1}{16}$

b) $8^{-\frac{2}{3}} = \frac{1}{8^{\frac{2}{3}}}$

$= \frac{1}{\left(\sqrt[3]{8}\right)^2}$

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

c) $\left(\frac{4}{5}\right)^{-3} = \left(\frac{5}{4}\right)^3$

$= \frac{5^3}{4^3}$

$= \frac{125}{64}$

d) $\left(\frac{4}{9}\right)^{\frac{5}{2}} = \left(\sqrt{\frac{4}{9}}\right)^5$

$= \left(\frac{2}{3}\right)^5$

$= \frac{32}{243}$

Exponent Laws

Product of Powers	$(x^a)(x^b) = x^{a+b}$		Power of a Quotient	$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$
Quotient of Powers	$\frac{x^a}{x^b} = x^{a-b}$		Power of Zero	$x^0 = 1$
Power of a Power	$(x^a)^b = x^{ab}$		Negative Exponents	$x^{-a} = \frac{1}{x^a}$
* Power of a product	$(xy)^a = x^a y^a$			

Example: Simplifies and writes each expression as a single power. Write each power with positive exponets.

a) $(2x^{-2})^5$

$= 2^5 (x^{-2})^5$

$= 32x^{-10}$

$= \frac{32}{x^{10}}$

b) $\frac{x^{-3}y^5}{xy^4}$

$= \frac{x^{-3}}{x^1} \cdot \frac{y^5}{y^4}$

$= x^{-4} y^1$

$= \frac{y}{x^4}$

$-3-1$

$5-4$

c) $\left(\frac{-6c^3}{a^{\frac{1}{2}}}\right)^{-2}$

$= \frac{(-6)^{-2}(c^3)^{-2}}{(a^{\frac{1}{2}})^{-2}}$

$= \frac{(-6)^{-2} c^{-6}}{a^{-1}}$

$= \frac{a^1}{(-6)^2 c^6}$

$= \frac{a}{36c^6}$

d) $\frac{\left(2r^{\frac{3}{2}}s^2\right)\left(r^{\frac{1}{2}}s^{-1}\right)}{6r^3s^{-4}}$

$= \frac{2r^{\frac{3}{2}} \cdot r^{\frac{1}{2}} \cdot s^2 \cdot s^{-1}}{6r^3s^{-4}}$

$= \frac{2r^2s^1}{6r^3s^{-4}}$

$= \frac{r^2 s^1}{3r^3 s^{-4}}$

$= \frac{r^{-1}s^5}{3}$

$= \frac{s^5}{3r^1}$ or $\frac{s^5}{3r}$

$\frac{3}{2} + \frac{1}{2} = \frac{4}{2} = 2$

$2 + (-1) = 1$

$2 - 3 = -1$

$1 - (-4) = 5$