

Unit 3 - Final Exam Review

1. Write in radical form

a) $42^{\frac{5}{4}}$

$= \sqrt[4]{42^5}$

or

$(\sqrt[4]{42})^5$

b) $(\frac{3}{4})^{\frac{6}{5}}$

$= \sqrt[5]{(\frac{3}{4})^6}$

or

$(\sqrt[5]{\frac{3}{4}})^6$

c) $-64^{\frac{1}{3}} = -1 \cdot 64^{\frac{1}{3}}$

$= -1 \cdot \sqrt[3]{64}$

or

$-\sqrt[3]{64}$

d) $(-7)^{\frac{3}{8}}$

$= \sqrt[8]{(-7)^3}$

or

$(\sqrt[8]{-7})^3$

2. Write in radical form and evaluate

a) $4^{\frac{5}{2}}$

$= (\sqrt{4})^5$

$= 2^5$

$= 32$

b) $27^{\frac{4}{3}}$

$= (\sqrt[3]{27})^4$

$= 3^4$

$= 81$

c) $81^{\frac{3}{4}}$

$= (\sqrt[4]{81})^3$

$= 3^3$

$= 27$

d) $64^{\frac{2}{3}}$

$= (\sqrt[3]{64})^2$

$= 4^2$

$= 16$

3. Write as an exponent

a) $\sqrt{10^3}$

$= 10^{\frac{3}{2}}$

b) $(\sqrt[4]{6})^3$

$= 6^{\frac{3}{4}}$

c) $(\sqrt[5]{62})^3$

$= 62^{\frac{3}{5}}$

d) $\sqrt{\left(\frac{3}{4}\right)^9}$

$= \left(\frac{3}{4}\right)^{\frac{9}{2}}$

e) $\left(\frac{4\sqrt{1/3}}{\sqrt{3}}\right)^5$

$= \left(\frac{1}{3}\right)^{\frac{5}{4}}$

f) $\sqrt[5]{-\frac{2}{9}}$

$= \left(-\frac{2}{9}\right)^{\frac{1}{5}}$

brackets are needed

4. Rewrite each power with positive exponents

a) $\left(\frac{14}{5}\right)^{-\frac{4}{3}}$

$= \left(\frac{5}{14}\right)^{\frac{4}{3}}$

b) $\left(\frac{1}{3}\right)^{-5}$

$= \left(\frac{3}{1}\right)^5$

or

3^5

c) $-3^{-6} = -1 \cdot 3^{-6}$

$= \frac{-1}{3^6}$

d) 14^{-3}

$= \frac{1}{14^3}$

e) $15^{-\frac{1}{4}}$

$= \frac{1}{15^{\frac{1}{4}}}$

f) $8^{-\frac{5}{2}}$

$= \frac{1}{8^{\frac{5}{2}}}$

5. Rewrite each power with positive exponents and evaluate

$$\begin{aligned} \text{a) } 3^{-4} &= \frac{1}{3^4} \\ &= \frac{1}{81} \end{aligned}$$

$$\begin{aligned} \text{b) } -49^{-\frac{3}{2}} &= -1 \cdot 49^{-\frac{3}{2}} \\ &= -\frac{1}{49^{\frac{3}{2}}} \\ &= \frac{-1}{(\sqrt{49})^3} \\ &= -\frac{1}{7^3} = -\frac{1}{343} \end{aligned}$$

$$\begin{aligned} \text{c) } \left(\frac{4}{3}\right)^{-3} &= \left(\frac{3}{4}\right)^3 \\ &= \frac{27}{64} \end{aligned}$$

$$\begin{aligned} \text{d) } 16^{-0.25} &= 16^{-\frac{1}{4}} \\ &= \frac{1}{16^{\frac{1}{4}}} \\ &= \frac{1}{\sqrt[4]{16}} = \frac{1}{2} \end{aligned}$$

6. Simplify and write as a single power with positive exponents

$$\begin{aligned} \text{a) } 3a^2 \cdot a^{-5} \cdot a^4 &= 3a^{2+(-5)+4} \\ &= 3a^1 \text{ ou } 3a \end{aligned}$$

$$\begin{aligned} \text{b) } (2x^2 \cdot 3x^{-5})^3 &= (6x^{2+(-5)})^3 \\ &= (6x^{-3})^3 \\ &= 6^3 x^{-9} = \frac{216}{x^9} \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{3a^2}{12a^{-3}} &= \frac{1a^{2-(-3)}}{4} \\ &= \frac{a^5}{4} \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{10x^{\frac{9}{4}}y^2}{8x^3y^{-1}} &= \frac{5x^{\frac{9}{4}-3}y^{2-(-1)}}{4} \\ &= \frac{5x^{-\frac{3}{4}}y^3}{4} = \frac{5y^3}{4x^{\frac{3}{4}}} \end{aligned}$$

$$\begin{aligned} \text{e) } (-5h^2k^{-3})^{-2} &= \frac{1}{(-5h^2k^{-3})^2} \\ &= \frac{1}{(-5)^2 h^4 k^{-6}} \\ &= \frac{k^6}{25h^4} \end{aligned}$$

$$\begin{aligned} \text{f) } (5x^0y^4)^{-4} \cdot y^{\frac{1}{2}} &= \frac{y^{\frac{1}{2}}}{(5y^4)^4} \\ &= \frac{y^{\frac{1}{2}}}{5^4 y^{16}} \\ &= \frac{y^{\frac{1}{2}-16}}{625} = \frac{y^{-\frac{31}{2}}}{625} = \frac{1}{625y^{\frac{31}{2}}} \end{aligned}$$

$$\begin{aligned} \text{g) } 2x^4y^2 \cdot (3xy^4)^2 &= 2x^4y^2 \cdot 3^2x^2y^8 \\ &= 2 \cdot 9 x^{4+2} y^{2+8} \\ &= 18x^6y^{10} \end{aligned}$$

$$\begin{aligned} \text{h) } (y^{-4}z^4)^3 \cdot (zy^2)^{-2} &= y^{-12}z^{12} \cdot z^{-2}y^{-4} \\ &= y^{-12+(-4)}z^{12+(-2)} \\ &= y^{-16}z^{10} \\ &= \frac{z^{10}}{y^{16}} \end{aligned}$$

$$i) (9m^{-4}n^6)^{\frac{1}{3}}(m^{-4}n)$$

$$= 9^{-\frac{1}{3}} m^{\frac{4}{3}} n^{-2} m^{-4} n$$

$$= 9^{-\frac{1}{3}} m^{\frac{4}{3}+(-4)} n^{-2+1} \rightarrow \frac{4}{3} - \frac{4 \times 3}{1 \times 3}$$

$$= 9^{-\frac{1}{3}} m^{-\frac{8}{3}} n^{-1}$$

$$= \frac{1}{\sqrt[3]{9} m^{\frac{8}{3}} n}$$

$$\frac{4}{3} - \frac{12}{3}$$

$$= -\frac{8}{3}$$

$$j) (m^4 n^2 \cdot -4m^{-1}n)^3$$

$$= (-4m^{4+(-1)}n^{2+1})^3$$

$$= (-4m^3 n^3)^3$$

$$= (-4)^3 m^9 n^9$$

$$= -64m^9 n^9$$

$$k) \frac{(m^2)^{-1}}{3n^2 \cdot m^4 n}$$

$$= \frac{m^{-2}}{3m^4 n^{2+1}}$$

$$= \frac{m^{-2-4}}{3n^3}$$

$$= \frac{m^{-6}}{3n^3} = \frac{1}{3m^6 n^3}$$

$$l) \left(\frac{32e^4 f}{e^{-1} f^6} \right)^{\frac{1}{5}}$$

$$= (32e^{4-(-1)} f)^{\frac{1}{5}}$$

$$= (32e^5 f)^{\frac{1}{5}}$$

$$= \sqrt[5]{32} \cdot e^1 f^{\frac{1}{5}}$$

$$= 2ef^{\frac{1}{5}}$$

$$m) \left(\frac{6x^{-3}y^2}{4x^2 \cdot x^4 y^{-4}} \right)^2$$

$$= \left(\frac{3x^{-3-2-4} y^{2-(-4)}}{2} \right)^2$$

$$= \left(\frac{3x^{-9} y^6}{2} \right)^2$$

$$= \frac{3^2 x^{-18} y^{12}}{2^2} = \frac{9y^{12}}{4x^{18}}$$

$$n) \frac{2yx^{-2} \cdot 3x^1}{(x^2 y^{-1})^3}$$

$$= \frac{6yx^{-2+1}}{x^6 y^{-3}}$$

$$= 6x^{-1-6} y^{1-(-3)}$$

$$= 6x^{-7} y^4$$

$$= \frac{6y^4}{x^7}$$

$$p) \frac{8x^3 y^3 z^{-2} \cdot x^{-3}}{(-2x^4 y^{-2})^2}$$

$$= \frac{8x^{3+(-3)} y^3 z^{-2}}{(-2)^2 x^8 y^{-4}}$$

$$= \frac{8x^0 y^3 z^{-2}}{4x^8 y^{-4}}$$

$$= \frac{2y^{3-(-4)}}{x^8 z^2}$$

$$= \frac{2y^7}{x^8 z^2}$$

$$o) \frac{(4ab^6)^2}{3b^{-1} \cdot 6b^{-4}}$$

$$= \frac{4^2 a^2}{18b^{-1+(-4)}}$$

$$= \frac{16a^2}{18b^{-5}}$$

$$= \frac{8a^2 b^5}{9}$$