*Use exponents to write each radical expression:*

1. $\sqrt[2]{3y} = (3y)^{\frac{1}{2}}$

2. $\sqrt[4]{5} = 5^{\frac{1}{4}}$

3. Rewrite the expression $z^{-\frac{4}{5}}$ as an equivalent expression **without the exponent** in simplest form.

$\frac{1}{z^{+\frac{4}{5}}} = \boxed{\frac{1}{(\sqrt[5]{z})^4} \text{ -or- } \frac{1}{\sqrt[5]{z^4}}}$

*Write an equivalent expression using positive exponents:*

4. $(6r)^{-3} = \frac{1}{(6r)^3}$ OR $\frac{1}{216r^3}$

5. $\frac{t^3}{t^{-7}} = \frac{t^{+3}}{t^{-7}} = \frac{t^3 \cdot t^{+7}}{1} = \boxed{t^{10}}$

6. $\frac{6k^{-4}}{8k} = \frac{{}^{3}\cancel{6}}{{}_{4}\cancel{8}k^1k^4} = \frac{3}{4k^5}$

7. Write the equation **without a denominator** and **simplify**. All variables represent positive numbers: $\left(\frac{3}{u^3v}\right)^{-2}$

$= \frac{3^{-2}}{(u^3v)^{-2}} = \frac{(u^3v)^2}{3^2} = \frac{u^6v^2}{9^1}$

$\boxed{= 9^{-1}u^6v^2}$

[*show all work*]

8. The value of $\left(\frac{3^0}{27^{\frac{2}{3}}}\right)^{-1}$ is:

$= \frac{(3^0)^{-1}}{(27^{\frac{2}{3}})^{-1}} = \frac{(27^{\frac{2}{3}})^1}{(3^0)^1} = \frac{27^{\frac{2}{3}}}{1^1} = \frac{(\sqrt[3]{27})^2}{1}$

$= \frac{3^2}{1} = \boxed{9}$

9. The expression $\frac{5^{\frac{1}{7}}}{5^{-\frac{2}{7}}}$ is equivalent to (simplify):

$\frac{5^{\frac{1}{7}} \cdot 5^{\frac{2}{7}}}{1} = \frac{5^{\frac{3}{7}}}{1} = \boxed{\sqrt[7]{5^3}}$

$5^{\frac{1}{7} - -\frac{2}{7}}$

$5^{\frac{1}{7} + \frac{2}{7}} = 5^{\frac{3}{7}} = (\sqrt[7]{5})^3$

$\sqrt[7]{125}$

10. Find the value of $(x+2)^0 + (x+1)^{-\frac{2}{3}}$ when x =7. [Remember show all work]

$(7+2)^0 + (7+1)^{-\frac{2}{3}}$

$9^0 + \frac{8^{-\frac{2}{3}}}{1}$

$1 + \frac{1}{8^{\frac{2}{3}}} = 1 + \frac{1}{(\sqrt[3]{8})^2} = 1 + \frac{1}{2^2} = 1\frac{1}{4}$ or $\frac{5}{4}$

*For #11-17, Checks are optional unless stated otherwise, but are strongly encouraged (4 points each; 6 points each for #'s with checks required)*

11. Solve for x: $x^{\frac{2}{3}} = 4$

$\frac{3}{2}(x^{\frac{2}{3}})\ 4^{\frac{3}{2}}$

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

$x = 2^3 = \boxed{8}$

$8^{\frac{2}{3}} \stackrel{?}{=} 4$

$(\sqrt[3]{8})^2 = 4$

$2^2 = 4$ ✓

12. Solve for y **and** Check: $x^{-\frac{3}{2}} + 4 = 12$

$-4 = -4$

$x^{-\frac{3}{2}} = 8$

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

$x = \frac{1}{\sqrt[3]{8}^2} = \boxed{x = \frac{1}{4}}$

Check $\left(\frac{1}{4}\right)^{-\frac{3}{2}} + 4 = 12$

$4^{\frac{3}{2}} + 4 = 12$

$(\sqrt{4})^3 + 4 = 12$

$2^3 + 4 = 12$

$12 = 12$ ✓

13. Solve for x **and** Check: $2x^{\frac{3}{4}} + 1 = 55$

Steps

1) get y alone

2) raise both sides to recip. power

3) solve

4) check

14. Solve for y: $y^{-\frac{1}{2}} = \left(\frac{1}{3}\right)^{-2}$

$(y^{-\frac{1}{2}})^{-\frac{2}{1}} = \left(\left(\frac{1}{3}\right)^{-2}\right)^{-\frac{2}{1}}$

$y^{-\frac{1}{2} \cdot -\frac{2}{1}} = \frac{1}{3}^{+4}$

$y^1 = \frac{1^4}{3^4} = \frac{1}{81}$ ✓

✓

Check:

$y^{-\frac{1}{2}} = \left(\frac{1}{3}\right)^{-2}$

$\left(\frac{1}{81}\right)^{-\frac{1}{2}} = \left(\frac{1}{3}\right)^{-2}$

$81^{\frac{1}{2}} = 3^2$

$9 = 9$ ✓

15. Solve for x: $49^x = 7^{x+1}$

$(7^2)^x = 7^{x+1}$

$7^{2x} = 7^{x+1}$

$2x = x+1$
$-x \quad -x$
$x = 1$

Check
$49^1 \overset{?}{=} 7^{(1)+1}$
$49 = 7^2$ ✓

16. Solve for x: $4^{3x+5} = 16$

$4^{3x+5} = 4^2$

$3x+5 = 2$
$-5 \quad -5$
$\frac{3x}{3} = \frac{-3}{3}$
$x = -1$

Check
$4^{3(-1)+5} \overset{?}{=} 16$
$4^2 = 16$ ✓

17. Solve for x **and** Check: $27^{2x+1} = 9^{4x}$

$(3^3)^{2x+1} = (3^2)^{4x}$

$3^{6x+3} = 3^{8x}$

$6x+3 = 8x$
$-6x \quad -6x$
$\frac{3}{2} = \frac{2x}{2}$
$\frac{3}{2} = x$

Check
$27^{2(\frac{3}{2})+1} = 9^{4(\frac{3}{2})}$
$27^{\frac{4}{3}+1} = 9^{\frac{12}{2}}$

*#18-21: Clearly indicate answers. (2 points each)*

18. The equation that defines the same function as $y = \left(\frac{1}{2}\right)^{-x}$ is:

a) $y = 2^{-x}$
b) $y = -2^x$
c) $y = 2^x$
d) $y = \left(\frac{1}{2}\right)^x$

$y = \left(\frac{2}{1}\right)^x = 2^x$

$y = \frac{1^{-x}}{2^{-x}} = \frac{2^x}{1^x} = \frac{2^x}{1}$

$\boxed{1^x = 1 \text{ always}}$

**[Show work leading to the following multiple choice answers]**

19. The expression $\frac{2\sqrt{x}}{x}$ is equivalent to:

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

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

$a)\ 2x^{\frac{1}{2}}$ $b)\ (2x)^{\frac{1}{2}}$ $c)\ 2x^{-\frac{1}{2}}$ $d)\ (2x)^{-\frac{1}{2}}$

20. The product of $2^{\frac{1}{2}} \cdot 8^{\frac{1}{3}}$ is *not* equal to:

$\sqrt{2} \cdot \sqrt[3]{8} = \sqrt{2} \cdot 2 = 2\sqrt{2}$

Plug into calc

$a)\ 16^{\frac{1}{6}}$ $b)\ 8^{\frac{1}{2}} = \sqrt{8}$ $c)\ 2^{\frac{3}{2}} = \sqrt{2^3} = \sqrt{8}$ $d)\ 2\sqrt{2} \approx 2.828$

$\sqrt[6]{16} \approx 1.5874$ $\sqrt[2]{8} \approx 2.828$ $\sqrt[2]{2^3} \approx 2.828$

21. Write an equivalent expression using positive exponents:

$\left(4x^{-1}y^{\frac{2}{3}}\right)^{\frac{3}{2}} = 4^{\frac{3}{2}} \cdot x^{-\frac{3}{2}} \cdot y^{\frac{6}{6}}$

$\sqrt[2]{4^3} \cdot \frac{1}{x^{\frac{3}{2}}} \cdot y^1$

$\sqrt{64} \cdot \frac{1}{\sqrt{x^3}} \cdot y$

$\frac{8}{1} \cdot \frac{1}{\sqrt{x^3}} \cdot \frac{y}{1} = \frac{8y}{\sqrt{x^3}}$