Pre-Calculus Notes Name: Key

Section 9.1 – Rational Exponents Period: ___

$5^{\frac{p}{q}}$ ← power, ← root

I like taking the root first in order to work w/ smaller number.

I. Evaluate WITHOUT the calculator.

1. $144^{1/2}$ $= \sqrt{144}$ $= \boxed{12}$	2. $16^{3/4}$ $= \left(\sqrt[4]{16}\right)^3$ $= 2^3 = \boxed{8}$	3. $(-125)^{2/3}$ $= \left(\sqrt[3]{-125}\right)^2$ $= (-5)^2 = \boxed{25}$
4. $100^{-1/2}$ $= \frac{1}{100^{\frac{1}{2}}}$ $= \frac{1}{\sqrt{100}} = \boxed{\frac{1}{10}}$	5. $\sqrt[3]{64^2}$ $= \left(\sqrt[3]{64}\right)^2$ $= 4^2 = \boxed{16}$	6. $\frac{1}{\sqrt{36^3}}$ $= \frac{1}{\left(\sqrt{36}\right)^3} = \frac{1}{6^3} = \boxed{216}$

II. Evaluate WITH the calculator. Round to the nearest thousandth.

1. $54^{4/3}$ ≈ 24.317	2. $18^{-3/5}$ ≈ 0.008	3. $\sqrt[9]{100^6} = 100^{\frac{6}{9}}$ ≈ 21.544	4. $\sqrt[7]{6^3} = 6^{\frac{3}{7}}$ ≈ 2.155

III. Simplify. NO NEGATIVE EXPONENTS! NO DECIMALS!

1. $\left(2x^{4/7}y^{1/5}\right)\left(5x^{3/14}y^{3/5}\right)$

$2 \cdot 5\, x^{\frac{4}{7}+\frac{3}{14}}\, y^{\frac{1}{5}+\frac{2}{5}}$

$\boxed{10\, x^{\frac{11}{14}}\, y^{\frac{3}{5}}}$

2. $\left(\frac{4x^2z^{-4}}{9y^3}\right)^{-1/2}$

$\left(\frac{9y^3}{4x^2z^{-4}}\right)^{\frac{1}{2}}$

$\sqrt{\frac{9y^3}{4x^2z^{-4}}}$

$\frac{3\sqrt{y^3}}{2xz^{-2}}$

$\boxed{\frac{3y^{\frac{3}{2}}z^2}{2x}}$

3. $\sqrt[3]{\sqrt[4]{x^{36}y^{-5}}}$

$\left(\left(x^{36}y^{-5}\right)^{\frac{1}{4}}\right)^{\frac{1}{3}}$

$\left(x^{36}y^{-5}\right)^{\frac{1}{12}}$

$x^{\frac{36}{12}}y^{-\frac{5}{12}}$

$x^3 y^{-\frac{5}{12}}$

$\boxed{\frac{x^3}{y^{\frac{5}{12}}}}$

4. $\sqrt[3]{64x} + 5\sqrt[3]{8x} - \left(\sqrt[3]{\frac{1}{27x}}\right)^{-1}$

$4\sqrt[3]{x} + 5 \cdot 2\sqrt[3]{x} - \left(\left(\frac{1}{27x}\right)^{\frac{1}{3}}\right)^{-1}$

$4\sqrt[3]{x} + 10\sqrt[3]{x} - (27x)^{\frac{1}{3}}$

$4\sqrt[3]{x} + 10\sqrt[3]{x} - 3\sqrt[3]{x}$

$11\sqrt[3]{x}$ so $\boxed{11x^{\frac{1}{3}}}$