Negative Exponent

Remember the rule for negative integer exponents: $a^{-n} = \dfrac{1}{a^n}$

For negative rational exponents when $a \neq 0$, $a^{-m/n} = \left(\dfrac{1}{a}\right)^{m/n} = \dfrac{1}{a^{m/n}} = \dfrac{1}{(\sqrt[n]{a})^m}$

Notice how the exponent becomes positive on the reciprocal of the base.

$$a^{-2/3} = \left(\frac{1}{a}\right)^{2/3} = \frac{1}{a^{2/3}} = \frac{1}{(\sqrt[3]{a^2})} \; or \; \frac{1}{(\sqrt[3]{a})^2}$$

$$125^{-1/3} = \left(\frac{1}{125}\right)^{1/3} = \frac{1}{125^{1/3}} = \frac{1}{\sqrt[3]{125}} = \frac{1}{5}$$

$$8^{-2/3} = \left(\frac{1}{8}\right)^{2/3} = \frac{1}{8^{2/3}} = \frac{1}{\sqrt[3]{8^2}} = \frac{1}{\sqrt[3]{64}} = \frac{1}{4}$$

TRY:

Rewrite as a radical and evaluate.

$16^{-3/4}$

$25^{-3/2}$

$(-8)^{-4/3}$

One applies the rule in the same way (using the reciprocal of the base) if a is a rational expression as in:

$$\left(\frac{27}{1000}\right)^{-1/3}=\left(\frac{1000}{27}\right)^{1/3}=\sqrt[3]{\frac{1000}{27}}=\frac{10}{3}$$

$$-\left(\frac{1024}{243}\right)^{-3/5}=-\left(\frac{243}{1024}\right)^{3/5}=-\left(\sqrt[5]{\frac{243}{1024}}\right)^{3}=-\left(\frac{3}{4}\right)^{3}=-\frac{27}{64}$$

TRY:

Rewrite as a radical and evaluate.

$$\left(\frac{27}{8}\right)^{-1/3}$$

$$\left(\frac{125}{27}\right)^{-2/3}$$

When powers are raised to negative powers, it may be easier to work with the exponents first:

$$\left(\frac{y^{-6}}{8x^{3/7}}\right)^{-2/3}=\frac{y^{-6(-\frac{2}{3})}}{8^{-\frac{2}{3}}x^{\frac{3}{7}(-\frac{2}{3})}}=\frac{y^{4}}{8^{-\frac{2}{3}}x^{-\frac{2}{7}}}=8^{\frac{2}{3}}x^{\frac{2}{7}}y^{4}=\left(\sqrt[3]{8}\right)^{2}x^{\frac{2}{7}}y^{4}=4x^{\frac{2}{7}}y^{4}$$