Foundations of Math & Pre-Calculus 10
Lesson 4.5 - Negative Exponents & Reciprocals

Powers with Negative Exponents

When \( x \) is any non-zero number and \( n \) is a rational number, \( x^{-n} \) is the reciprocal of \( x^n \).

\[ x^{-n} = \frac{1}{x^n} \quad \text{For example: } 10^{-2} = \frac{1}{10^2} = \frac{1}{100} \]

and \( \frac{1}{x^{-n}} = x^n \) \quad \text{or } \left(\frac{1}{2^{-4}}\right) = 2^4 = 16

Example #1: Simplify and evaluate each of the following (where possible).

a) \( 7^{-2} = \frac{1}{7^2} \quad \text{simplified} \quad \frac{1}{49} \quad \text{evaluated} \)

b) \( \left(\frac{10}{3}\right)^{-3} = \left(\frac{3}{10}\right)^3 = \frac{27}{1000} \)

c) \( \left(-\frac{10}{3}\right)^{-3} = \left(-\frac{3}{10}\right)^3 = \frac{-27}{1000} \)

d) \( x^{-5} = \frac{1}{x^5} = \left(\frac{1}{x}\right)^5 \)

e) \( \frac{1}{a^{-6}} = a^6 \)

f) \( \left(\frac{m}{n}\right)^{-3} = \left(\frac{3n}{m}\right)^3 \)

The negative can "attach" to either the 10 or the 3... I like to keep it on top.