8.EE Raising to the zero and negative powers

Task

In this problem c represents a positive number.

The quotient rule for exponents says that if m and n are positive integers with $m > n$, then

$$\frac{c^m}{c^n} = c^{m-n}.$$

After explaining to yourself why this is true, complete the following exploration of the quotient rule when $m \leq n$:

a. What expression does the quotient rule provide for $\frac{c^m}{c^n}$ when $m = n$?

b. If $m = n$, simplify $\frac{c^m}{c^n}$ without using the quotient rule.

c. What do parts (a) and (b) above suggest is a good definition for c^0?

d. What expression does the quotient rule provide for $\frac{c^0}{c^n}$?

e. What expression do we get for $\frac{c^0}{c^n}$ if we use the value for c^0 found in part (c)?

f. Using parts (d) and (e), propose a definition for the expression c^{-n}.