$$\frac{x^3}{x^5} = x^{3-5} = x^{-2} = \boxed{\frac{1}{x^2}}$$

Lesson 5: Negative Exponents and the Laws of Exponents

$$\frac{x^3}{x^5} = \frac{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}}{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}\cdot x \cdot x} = \boxed{\frac{1}{x^2}}$$

Classwork

Definition: For any positive number x and for any positive integer n, we define $x^{-n} = \frac{1}{x^n}$. $5^{-3} = \frac{1}{5^3}$

Note that this definition of negative exponents says x^{-1} is just the reciprocal, $\frac{1}{x}$, of x.

As a consequence of the definition, for a positive x and all *integers* b, we get

$$x^{-b} = \frac{1}{x^b}.$$

Exercise 1

Verify the general statement $x^{-b} = \frac{1}{x^b}$ for $x = 3$ and $b = -5$.

Exercise 2

What is the value of (3×10^{-2})?

Exercise 3

What is the value of (3×10^{-5})?

Exercise 4

Write the complete expanded form of the decimal 4.728 in exponential notation.

$$\frac{a^2 b^{-3}}{c^{-4}} = \frac{a^2 c^4}{b^3}$$

For Exercises 5–10, write an equivalent expression, in exponential notation, to the one given and simplify as much as possible.

Exercise 5

$5^{-3} =$

Exercise 6

$\frac{1}{8^9} = 8^{-9}$

Exercise 7

$3 \cdot 2^{-4} =$

Exercise 8

Let x be a nonzero number.

$x^{-3} =$

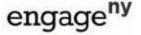## Exercise 9

Let x be a nonzero number.

$\frac{1}{x^9} =$

Exercise 10

Let x, y be two nonzero numbers.

$xy^{-4} =$