

# Combining Exponents

Basic Math for Economics – Refresher

# Introduction

- These lessons are designed to assist with some math tricks that are commonly used in economics.
  - In this lesson, let's talk about combining exponents.
  - Previously, we saw

$$MRS = -\frac{MU_x}{MU_y} = -\frac{0.4x^{-0.6}y^{0.6}}{0.6x^{0.4}y^{-0.4}}$$

- There are many opportunities to simplify this fraction, especially with regard to the exponents.
  - We just need to remember a couple of rules!

# Combining Exponents

- Recall that when we multiply two exponents of the same base together, we simply add their exponents together, i.e.,

$$x^2 x^4 = x^{2+4} = x^6$$

- The same thing happens when dividing exponents. Only now, we subtract our exponents.

$$\frac{x^2}{x^4} = x^{2-4} = x^{-2}$$

- Also, don't forget that a negative exponent can be turned into a positive exponent by taking its reciprocal.

$$x^{-2} = \frac{1}{x^2}$$

# Combining Exponents

$$MRS = -\frac{MU_x}{MU_y} = -\frac{0.4x^{-0.6}y^{0.6}}{0.6x^{0.4}y^{-0.4}}$$

- Let's use this trick to simplify this fraction.
  - The first set of terms is simple, it's just  $\frac{0.4}{0.6}$ , or  $\frac{2}{3}$ .
  - Now, looking at the second set of terms,

$$\frac{x^{-0.6}}{x^{0.4}} = x^{-0.6-0.4} = x^{-1} = \frac{1}{x}$$

- Finally, looking at the third set of terms,

$$\frac{y^{0.6}}{y^{-0.4}} = y^{0.6-(-0.4)} = y^1 = y$$

# Combining Exponents

$$MRS = -\frac{MU_x}{MU_y} = -\frac{0.4x^{-0.6}y^{0.6}}{0.6x^{0.4}y^{-0.4}}$$

- Putting it all together, we obtain,

$$MRS = -\frac{MU_x}{MU_y} = -\frac{2y}{3x}$$

- This is a useful trick when working with utility maximization problems.
  - Taking a moment to simplify expressions greatly eases further analysis.