

Homework 18

Key

Due: Friday, October 30, at the start of class.

1) Suppose your utility is given by:  $U = Q_{Milk}^{0.3} Q_{Cookies}^{0.7}$  (where  $Q_{Milk}$  is measured in ounces, and  $Q_{Cookies}$  is measured in cookies).

a) What is the marginal utility of milk?

$$\frac{\partial U}{\partial Milk} = (0.3) Q_m^{-0.7} Q_c^{0.7}$$

b) What is the marginal utility of cookies?

$$\frac{\partial U}{\partial Cookies} = (0.7) Q_m^{0.3} Q_c^{-0.3}$$

c) In the real world, if I give you a cookie, does this increase or decrease your desire for milk? Does that make them substitutes or complements?

Increase, complements

d) The way that we quantify part (c) mathematically is to model "desire for milk" as its marginal utility, and the effect of the cookie as the partial derivative of that marginal utility with respect to the quantity of cookies. What is this partial derivative? Does it suggest that milk and cookies are substitutes or complements? What should we do with our utility function if it doesn't say they are complements?

$$\frac{\partial^2 U}{\partial M \partial C} = (0.21) Q_m^{-0.7} Q_c^{-0.3}$$

If I give you a cookie, your marginal utility of milk goes down because of the negative exponent on cookies. This makes them substitutes. We probably need a more complex utility function to get complements.