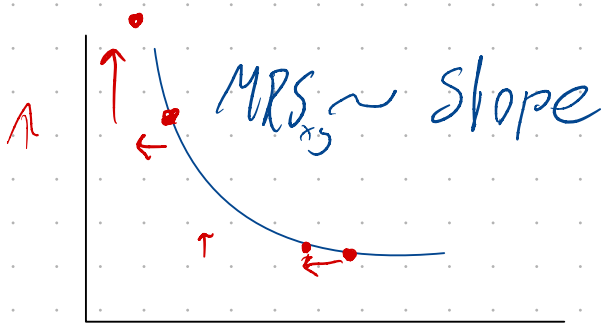
The Marginal Rate of Substitution

The marginal rate of substitution of x for y (MRS_{xy}) is the rate at which a consumer is willing to substitute 1 unit of X for more of good y and be indifferent about the substitution. → utility held constant

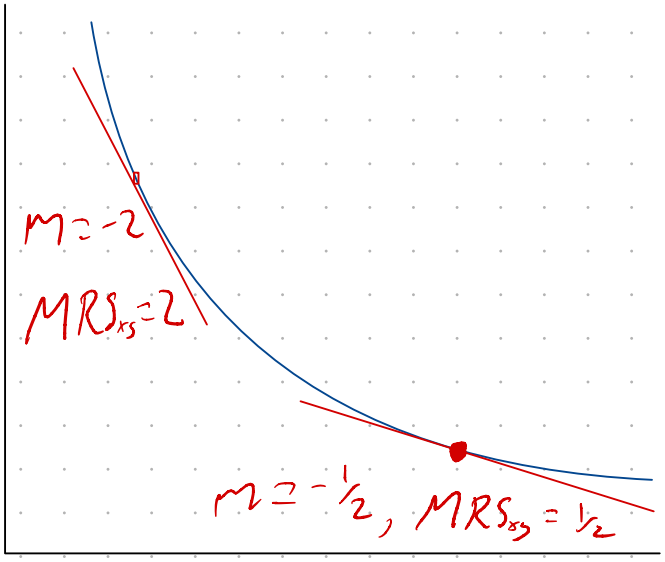
→ remain on indifference curve

$$MRS_{xy} = -\frac{\Delta Y}{\Delta X}$$



Relationship between MRS and MU

$$MRS_{xy} = -\frac{\Delta Y}{\Delta X}$$



$$\Delta U = MU_x \cdot \Delta X + MU_y \cdot \Delta y$$

Set $\Delta U = 0$

$$0 = MU_x \cdot \Delta X + MU_y \cdot \Delta y$$

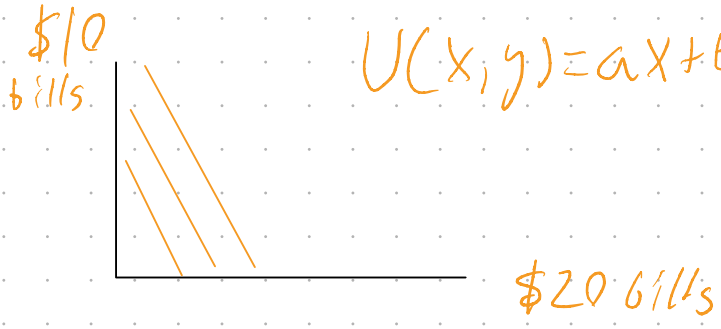
$$-MU_y \cdot \Delta y = MU_x \cdot \Delta X$$

$$-\frac{\Delta y}{\Delta X} = \frac{MU_x}{MU_y} \rightarrow MRS_{xy} = \frac{\frac{dU}{dx}}{\frac{dU}{dy}}$$

Some observations about the shape of indifference curves.

- perfectly flat curves (lines)

Perfect Substitutes



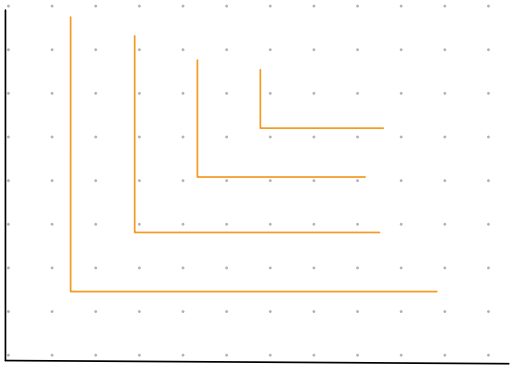
$U(x,y) = ax + by$

- Substitutes: pretty flat curves

- Complements: more curved

- Perfect complements

$U(x,y) = \min(x,y)$



Practice

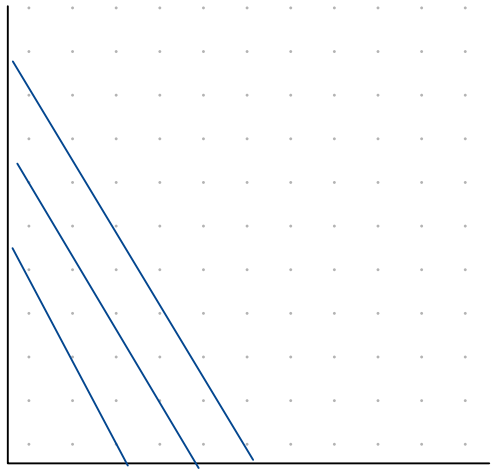
- What is MU_x?
- What is MU_y?
- What is MRS_{xy}?
- Draw indifference curves

1. $U(x,y) = 4x + 3y$

a. $\frac{dU}{dx} = 4$

b. $\frac{dU}{dy} = 3$

c. $\frac{\frac{dU}{dx}}{\frac{dU}{dy}} = 4/3$



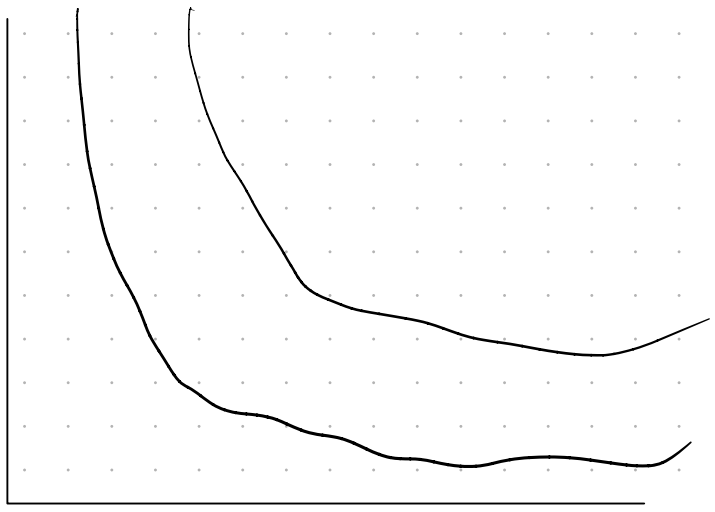
2. $U(x,y) = xy + x$

a. $\frac{dU}{dx} = y + 1$

b. $\frac{dU}{dy} = x$

c. $MRS_{xy} = \frac{y+1}{x}$

d.



3. $U(x,y) = x^{.5}y^{.5}$

a. $.5 \cdot x^{-.5}y^{.5}$

b. $.5x^{.5}y^{-.5}$

c. $\frac{.5x^{-.5}y^{.5}}{.5x^{-.5}y^{-.5}} = \frac{y^{.5}y^{.5}}{x^{.5}x^{.5}} = \frac{y}{x}$

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

d.