

$$\mathcal{L}(x, y, \lambda) = \alpha \ln x + (1-\alpha) \ln y + \lambda (I - p_x x - p_y y)$$

Handwritten notes: $\alpha \ln x$ is circled in red. $\ln y$ has a red arrow pointing to $\ln(x, y)$. $m u_x$ is written in red below the first term.

$$\frac{\partial \mathcal{L}}{\partial x} = \left(\frac{\alpha}{x} \right) - \lambda p_x = 0 \Rightarrow \lambda = \left(\frac{\alpha}{x} \right) \cdot \frac{1}{p_x}$$

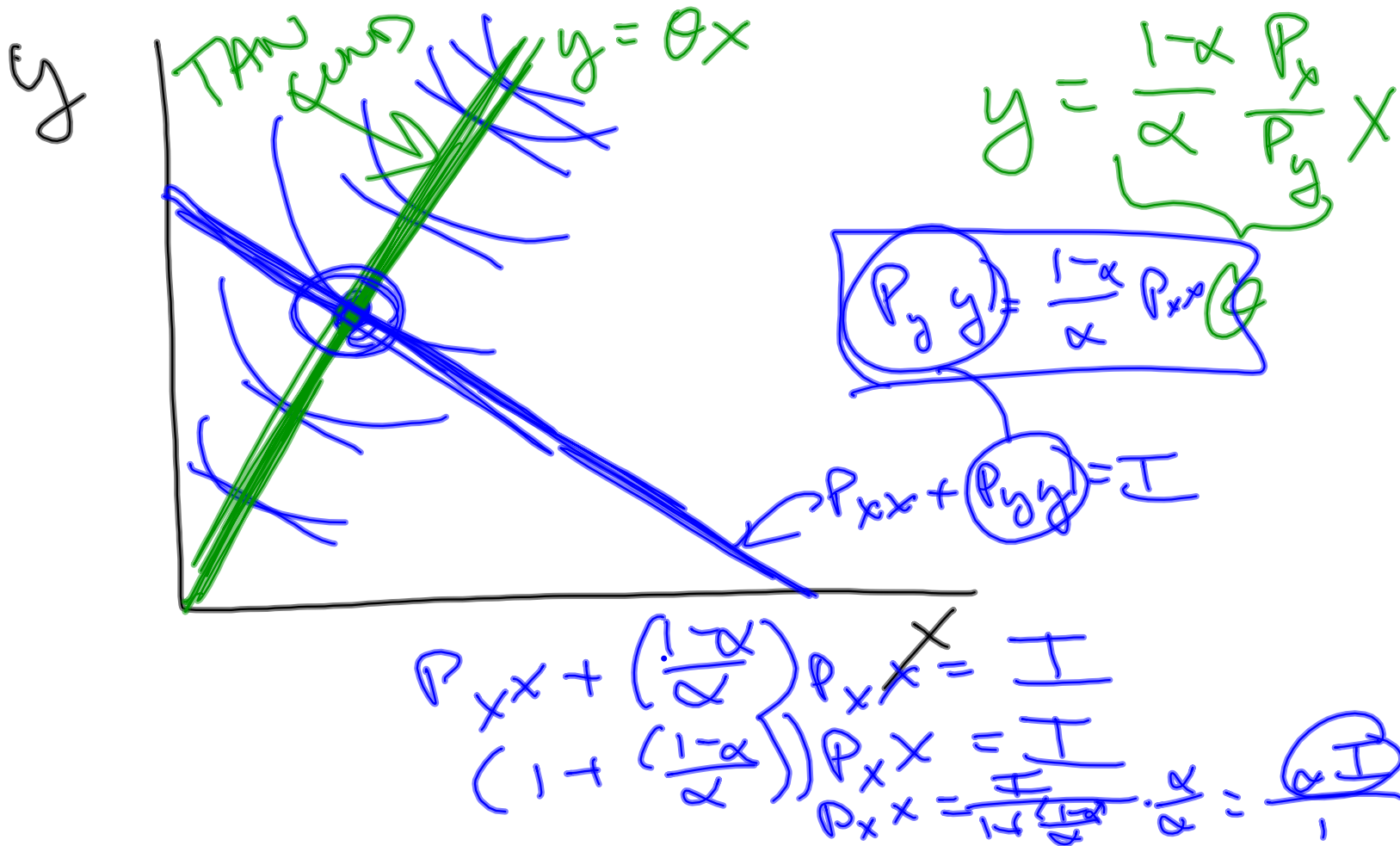
Handwritten notes: $\frac{\alpha}{x}$ is circled in red. $\frac{1}{p_x}$ is circled in blue. A red arrow points from $\frac{\alpha}{x}$ to $m u_x$. A blue arrow points from $\frac{1}{p_x}$ to $m a_x$.

$$\frac{\partial \mathcal{L}}{\partial y} = \frac{1-\alpha}{y} - \lambda p_y = 0 \Rightarrow \lambda = \frac{1-\alpha}{y} \cdot \frac{1}{p_y}$$

Handwritten notes: $\frac{1-\alpha}{y}$ is circled in red. $\frac{1}{p_y}$ is circled in blue. A red arrow points from $\frac{1-\alpha}{y}$ to $m u_y$. A blue arrow points from $\frac{1}{p_y}$ to $m a_y$.

$$\frac{\frac{\alpha}{x}}{\frac{1-\alpha}{y}} = \frac{p_x}{p_y} \Rightarrow \alpha p_y y = (1-\alpha) p_x x$$

Handwritten notes: $\frac{\alpha}{x}$ and $\frac{y}{1-\alpha}$ are circled in red. The final result is boxed in green.



\$ spent on X

$$P_X X = \alpha I$$

fact of nature

$$X = \alpha \frac{I}{P_X}$$

$$g^D(P_X, P_Y, I) = \frac{\alpha I}{P_X}$$