

$$d \ln X = \frac{1}{X} \cdot dX$$

$$\boxed{\frac{d \ln X}{dX} = \frac{1}{X}}$$

$$y = x^2 - x + 1 \quad (2 \times 1)$$

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1st order : $2x - 1$

2nd order : $2 \cdot (2-1) \cdot x^{2-2}$

< 0

CO

convane

$$\alpha = 0.5$$

$$\text{For: } 0.5 X^{-0.5} - 1 = 0$$

$$\rightarrow X^* = \frac{1}{4}$$

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$$y = X^\beta - (X + 1), \beta > 1$$

$$\text{1st order: } \beta \cdot X^{\beta-1} - 1$$

$$\text{2nd - - : } \beta \cdot (\beta - 1) \cdot X^{\beta-2} > 0$$

$$\beta = 2$$

$$\rightarrow \text{FOC: } 2 \cdot X - 1 = 0$$

$$X_{\min} = \frac{1}{2}$$

$$y_{\min} = \frac{3}{4}$$

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$$\max_{x, y} f(x, y) = xy$$

$$\text{s.t. } 3x + 4y = 16$$

$$\text{b.c. } \rightarrow x = \frac{16 - 4y}{3}$$

$$\rightarrow \text{Max } \frac{16-4y}{3} \cdot y$$

For wrt y

$$-\frac{4}{3}y + \frac{16-4y}{3} = 0$$

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$$y^* = 2$$

$$x^* = \frac{8}{3}$$

$$\max_{x, y} u(x, y)$$

$$s.t. \quad p_x \cdot x + p_y \cdot y \leq M$$

$$b.c. \quad \rightarrow x = \frac{M - p_y \cdot y}{p_x}$$

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$$\rightarrow \max_y u\left(\frac{M - p_y \cdot y}{p_x}, y\right)$$

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$$F.O.C.: u'_x(x) \cdot x'(y) + u'_y(y) = 0$$

$$1 \text{ eq}^n \rightarrow y^* \xrightarrow{b.c.} x^*$$

$$x + \sqrt{xy} + y \leq 1$$

$$\sqrt{xy} = 1 - x - y$$

$$xy = (1 - x - y)^2$$

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$$\mathcal{L} = xy - \lambda [3x + 4y - 16]$$

$$\max_{x, y, z} f(x, y, z) = (1+x) \cdot y \cdot z$$

$$\text{s.t. } x + y + z \leq 1$$

Lagrangian

$$\mathcal{L} = (1+x)yz + \lambda(1-x-y-z)$$

For

wrt x : $\frac{\partial \mathcal{L}}{\partial x} : yz - \lambda = 0$ ①

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y : $\frac{\partial \mathcal{L}}{\partial y} : (1+x)z - \lambda = 0$ ②

z : $\frac{\partial \mathcal{L}}{\partial z} : (1+x) \cdot y - \lambda = 0$ ③

λ : $1-x-y-z=0$ ④

$$2 - 3 \Rightarrow y = 2$$

$$\begin{aligned} D' : & \quad y^2 - X = 0 \rightarrow \\ 2' : & \quad (1+X) \cdot y - X = 0 \end{aligned}$$

$$3' : \quad 1 - X - 2y = 0$$

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$$1' - 2' \Rightarrow$$

$$y = 1 + X$$

$$1 - X - 2(1 + X) = 0$$

$$X^* = -\frac{1}{3}$$

$$y^* = \frac{2}{3}$$

$$z^* = \frac{2}{3}$$

$$\lambda = ?$$

$$f^* = \frac{8}{27}$$

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max

C_1, C_2

n_1, n_2

$\ln C_1 + \alpha \ln(1-n_1) + \beta [\ln C_2 + \alpha \ln(1-n_2)]$

s.t. $C_1 + C_2 = n_1 w_1 + n_2 w_2$

lifetime b.c.

dynamic

β : discount factor
 $0 < \beta < 1$ ← $\beta = 1$
 $\beta = 0.99$ $\beta \geq 1$

24 hrs ← lifetime
work(n_1)

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$$n_1 = \frac{1}{3}$$

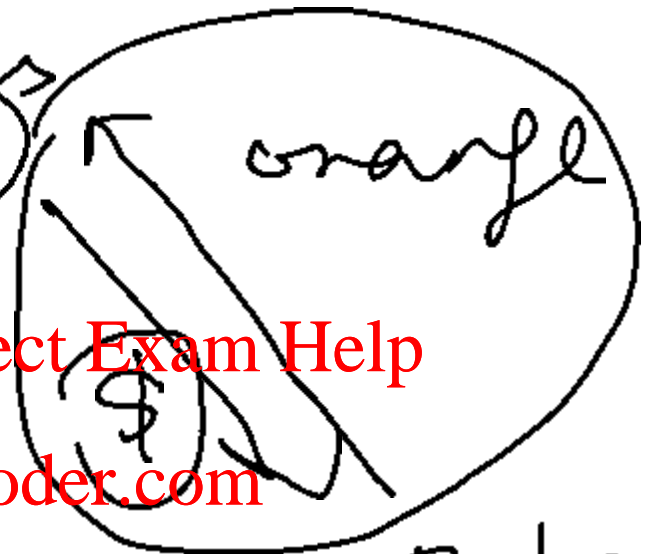
w/o Money

0

eats orange

1

produces
apple



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eats
apple

3

produces
banana



eats banana

2

produces
orange

w/ money

legal tender

perfect (X)

Record-keeping
System → credits

1

here

here

apple

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3

banana

2

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