EC1340-Fall 2025
Problem Set 10 solutions

(Updated 29 July 2025)

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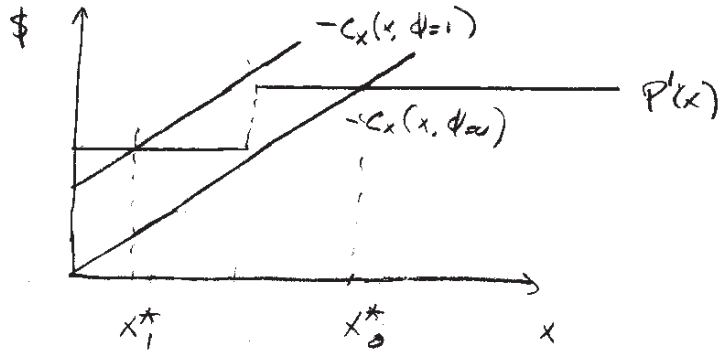
1. a. $C(x,\phi) = 10 - \phi x - \frac{1}{2}x^2$ $\quad \phi = \begin{cases} 0 & 1/2 \\ 1 & 1/2 \end{cases}$

$\Rightarrow C_x(x,\phi) = -\phi - x$

$P(x) = sx + p\max(x-\ell, 0)$

TO FIND FIRM BEHAVIOR, EQUATE $P'(x) = -C_x$, AND FIND OPTIMAL FIRM CHOICE GRAPHICALLY.



- N.B.: LOTS OF OTHER WAYS TO DRAW $P'(x)$ DEPENDING ON PARAMETERS.

THEN x_0^* SOLVES

$$P'(x_0^*) = -C_x(x_0^*, \phi=0)$$

$$\Rightarrow \quad s+p = x_0^*$$

x_1^* SOLVES

$$P'(x_1^*) = -C_x(x_1^*, \phi=1)$$

$$s = 1 + x_1^*$$

$$\Rightarrow x_1^* = s-1$$

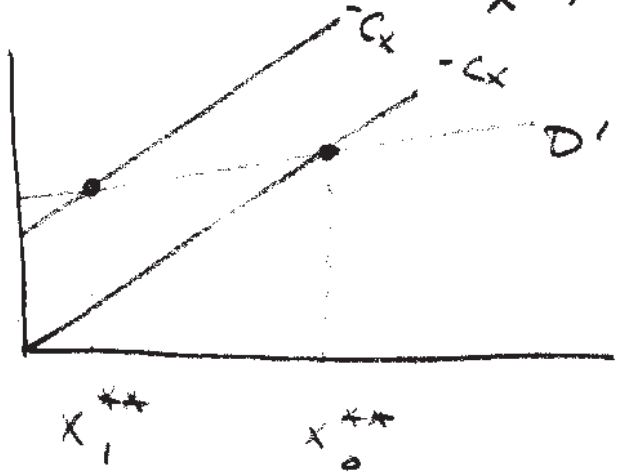
→

[b] $D(x) = \frac{11}{10}x + \frac{1}{4}x^2$

$\Rightarrow D'(x) = \frac{11}{10} + \frac{1}{2}x$

TO FIND PLANNER'S OPTIMUM IN EACH STATIC, SOLVE $\quad \min D(x) + C(x, \phi)$

$\Rightarrow D'(x) = -C_x(x, \phi)$



x_1^{**} SOLVES $\quad \frac{11}{10} + \frac{1}{2}x_1^{**} = 1 + x_1^{**}$

$\Rightarrow \quad x_1^{**} = 1/5$

x_0^{**} SOLVES $\quad \frac{11}{10} + \frac{1}{2}x_0^{**} = x_0^{**}$

$\Rightarrow \quad x_0^{**} = 11/5$

(c) CHOOSE $\quad s, p, \ell \quad$ SO THAT

$x_0^{**} = x_0^*$

$x_1^{**} = x_1^*$

$$x^{**}_1 = x^*_1$$

$$\Rightarrow \quad 1/5 - = 5 - 1 \quad \Rightarrow \quad 5^* = 6/5$$

$$x^{**}_0 = x^*_0$$

$$\Rightarrow \quad 11/5 - = 5 + p \quad \Rightarrow \quad p^* = 1$$

AND l AT MIDPOINT BETWEEN x^*_0, x^*_1

$$\Rightarrow \quad l^* = 6/5$$