Consultant for the Journal of Important Stuff

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a.) First-order conditions:

Total: 10

1 $\boxed{S_E = 310 - 4E - A} = 0$ 1.

1 $\boxed{S_A = 100 - A - E} = 0$.

$$\Rightarrow \quad A + 4E = 310.$$
$$A + E = 100.$$

$$\boxed{\underbrace{\begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix}}\begin{bmatrix} A \\ E \end{bmatrix} = \begin{bmatrix} 310 \\ 100 \end{bmatrix}}$$ 2

Call this matrix M.

Using Cramer's Rule, we know

1/2 $\boxed{A^* = \dfrac{|M_1|}{|M|}}$ and 1/2 $\boxed{E^* = \dfrac{|M_2|}{|M|}}$

$\boxed{|M| = 1 - 4 = -3}$. 1

1/2 $\boxed{|M_1| = 310 - 400 = -90}$

1/2 $\boxed{M_1 = \begin{bmatrix} 310 & 4 \\ 100 & 1 \end{bmatrix}}$

1/2 $\boxed{|M_2| = 100 - 310 = -210}$

1/2 $\boxed{M_2 = \begin{bmatrix} 1 & 310 \\ 1 & 100 \end{bmatrix}}$

(B)

$A^* = \dfrac{-90}{-3} = 30$ 1/2.

$E^* = \dfrac{-210}{-3} = 70.$ 1/2.

b.) $H = \begin{bmatrix} S_{EE} & S_{EA} \\ S_{AE} & S_{AA} \end{bmatrix}$ 1.

$S_{EE} = -4 \quad S_{EA} = -1$

$S_{AA} = -1 \quad S_{AE} = -1.$ 1.

$\Rightarrow H = \begin{bmatrix} -4 & -1 \\ -1 & -1 \end{bmatrix}$

$LPM_1 = -4$ 1.

$LPM_2 = |H| = 4 - 1 = 3$. 1/2. 1

The alternation of the signs of the LPM's, 1
1/2 with the first negative, indicates that
the Hessian is negative definite. 1
or d^2f or second differential

Therefore, the solution is a local 1
maximum.