

Surat Pernyataan Kejujuran Akademik

Dalam ujian matakuliah Matematika Lanjutan ini:

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Saya menyatakan dengan sejujurnya bahwa:

1. Saya tidak menerima dan atau tidak memberikan bantuan dalam bentuk apapun kepada mahasiswa lain dalam mengerjakan soal ujian
2. Saya tidak melakukan plagiasi atau pekerjaan orang lain dan mengakuinya sebagai pekerjaan saya
3. Saya memahami bahwa segala tindakan kecurangan akan mendapatkan hukuman sesuai dengan aturan yang berlaku pada Fakultas Ekonomi dan Bisnis Universitas Indonesia.



Depole, 03 November 2020

Yudhistira Gowo Samlaji

Soal 1.

UTS Matematika Ekonomi 1

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Dosen: Prof. Wachrowi.

a. $U = 2x^2 + 8xy + 4y^2 + 18$

st. $20x + 30y \leq 250 \rightarrow 2x + 3y \leq 25$

$20x \leq 10 \rightarrow 2x \leq 1$

$x, y \geq 0$

b. $\mathcal{L} = 2x^2 + 8xy + 4y^2 + 18 + \lambda(25 - 2x - 3y) + \phi(1 - 2x)$

c. $\frac{\partial \mathcal{L}}{\partial x} = 4x + 8y + (-2\lambda) + (-2\phi) = 0$

$\frac{\partial \mathcal{L}}{\partial y} = 8x + 8y + (-3\lambda) = 0$

$\frac{\partial \mathcal{L}}{\partial \lambda} = 25 - 2x - 3y = 0$

$\frac{\partial \mathcal{L}}{\partial \phi} = 1 - 2x = 0$

d. ① $x > 0; y > 0; \lambda > 0; \phi > 0$

$\frac{\partial \mathcal{L}}{\partial \phi} : 0 = 1 - 2x$
 $2x = 1$
 $x = \frac{1}{2} \checkmark$

$\frac{\partial \mathcal{L}}{\partial \lambda} : 0 = 25 - 2(\frac{1}{2}) - 3y$
 $3y = 24$
 $y = 8 \checkmark$

$\frac{\partial \mathcal{L}}{\partial y} : 0 = 8(\frac{1}{2}) + 8(8) - 3\lambda$
 $3\lambda = 4 + 64$

$\lambda = \frac{68}{3} \checkmark$

$\frac{\partial \mathcal{L}}{\partial x} : 0 = 4(\frac{1}{2}) + 8(8) - 2(\frac{68}{3}) - 2\phi$

$2\phi = 2 + 64 - \frac{136}{3}$

$2\phi = \frac{108}{3} - \frac{136}{3}$

$\phi = \frac{62}{6} \checkmark$

$x^* = \frac{1}{2}$
 $y^* = 8$

Soal 2:

$$D(Q) = \frac{100}{\sqrt{Q}}$$

$$S(Q) = \sqrt{Q}$$

UTS Matematika Ekonomi 1

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a. $D(Q) = S(Q)$

$$\frac{100}{\sqrt{Q}} = \sqrt{Q}$$

$$\frac{100}{Q^{1/2}} = Q^{1/2}$$

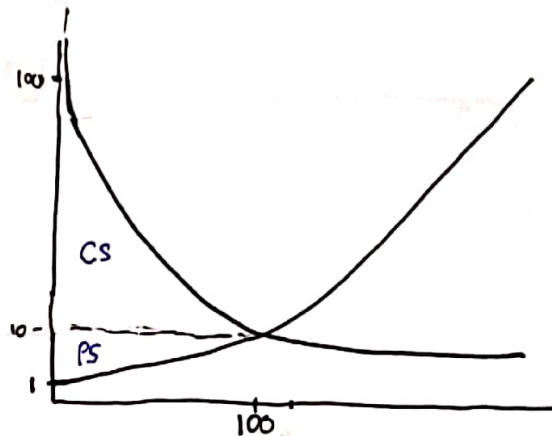
$$100 = Q^*$$

$$P^* = D(Q^*)$$

$$P^* = \frac{100}{\sqrt{100}}$$

$$P^* = \frac{100}{10}$$

$$P^* = 10$$



b. $CS = \int_0^{100} D(Q) - (Q^* \cdot P^*)$

$$= \int_0^{100} \frac{100}{\sqrt{Q}} - (100 \cdot 10)$$

$$= 100 \int_0^{100} \frac{1}{\sqrt{Q}} - (100 \cdot 10)$$

$$= 100 \left[\frac{Q^{1/2}}{1/2} \right]_0^{100} - (100 \cdot 10)$$

$$= 100 [2\sqrt{100}] - (1000)$$

$$= 100 [2 \cdot 10] - (1000)$$

$$= 2000 - 1000$$

$$CS^* = 1000$$

$$PS = (Q^* \cdot P^*) - \int_0^{100} S(Q)$$

$$= (100 \cdot 10) - \int_0^{100} Q^{1/2}$$

$$= (1000) - \left[Q^{3/2} \cdot \frac{2}{3} \right]$$

$$= (1000) - \left[(100)^{3/2} \cdot \frac{2}{3} \right]$$

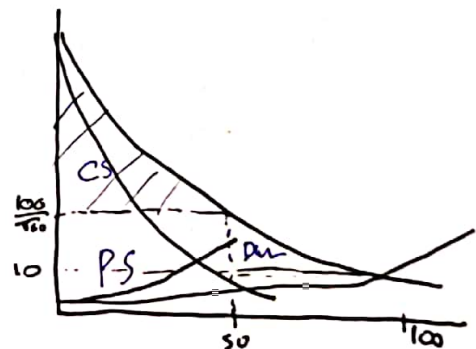
$$= 1000 - 666 \frac{2}{3}$$

$$PS^* = 333 \frac{1}{3}$$

$$TW = CS + PS$$

$$= 1000 + 333 \frac{1}{3}$$

$$TW = 1333 \frac{1}{3}$$



c. $MR(Q) = TR'$

$$= (AR \cdot Q)'$$

$$= (D(Q) \cdot Q)'$$

$$= \left(\left(\frac{100}{\sqrt{Q}} \right) (Q) \right)'$$

$$= (100 \cdot Q^{1/2})'$$

$$MR(Q) = 50 \cdot Q^{-1/2}$$

$$MR(Q) = MC(Q)$$

$$50 \cdot Q^{-1/2} = \sqrt{Q}$$

$$50 = Q^*$$

$$P^* = \frac{100}{\sqrt{50}}$$

$$P^* = \frac{100}{7.07}$$

* $AR = D(Q)$
 $MC = S(Q)$

$$CS_M = \int_0^{50} D(Q) - (Q^* \cdot P^*)$$

$$= \int_0^{50} \frac{100}{\sqrt{Q}} - \left(50 \cdot \frac{100}{\sqrt{50}} \right)$$

$$= 100 \left[2\sqrt{Q} \right]_0^{50} - \left(50 \cdot \frac{100}{\sqrt{50}} \right)$$

$$CS_M = 707.1068$$

$$PS_M = (Q^* \cdot P^*) - \int_0^{50} S(Q)$$

$$= \left(50 \cdot \frac{100}{\sqrt{50}} \right) - \int_0^{50} Q^{1/2}$$

$$= \left(50 \cdot \frac{100}{7.07} \right) - \left(Q^{3/2} \cdot \frac{2}{3} \right)$$

$$= \left(50 \cdot \frac{100}{7.07} \right) - \left(50^{3/2} \cdot \frac{2}{3} \right)$$

$$PS_M = 471.4045$$

$$WEM = CS_M + PS_M$$

$$= 707.1068 + 471.4045$$

$$= 1178.5113$$

Menbandingkan Welfare B dan C, dapat disimpulkan bahwa monopoli tidak dapat memaksimalkan welfare.

Sol 3:

$$(3t^2 + 4yt)dt + (2t^2 + 2y)dy = 0$$

$$\gamma(7.5) = 10$$

$$a. M = \frac{\partial F}{\partial t}; N = \frac{\partial F}{\partial y}$$

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial t}$$

$$4t = 4t$$

$$F = \int M dy + \psi(t)$$

$$F(y, t) = \int (2t^2 + 2y) dy + \psi(t)$$

$$= 2t^2 y + y^2 + \psi(t)$$

$$F(y, t) = 2t^2 y + y^2 + t^3 + k$$

$$= y(2t^2 + y) = C - t^3$$

$$(y^2 + 2t^2 y + t^4) - t^4 = C - t^3$$

$$(y + t^2)^2 - t^4 = C - t^3$$

$$(y + t^2) = C - t^3 + t^4$$

$$y + t^2 = \sqrt{C - t^3 + t^4}$$

$$y = \sqrt{C - t^3 + t^4} - t^2$$

$$\gamma(7.5) = 10$$

$$10 = \sqrt{C - (7.5)^3 + (7.5)^4} - (7.5)^2$$

$$10 = \sqrt{C - (421.875) + (3.169,0625)} - 56.25$$

$$(66.25)^2 = C - 2742.1875$$

$$4389.0625 + 2742.1875 = C$$

$$C = 7,131.25 \rightarrow \gamma(t) = \sqrt{7,131.25 - t^3 + t^4} - t^2$$

$$b. \gamma(0) = \sqrt{7,131.25 - 0 + 0} - 0$$

$$= 84.9967$$

$$\gamma(1) = \sqrt{7,131.25 - 1 + 1} - 1^2$$

$$= 83.4467$$

$$\gamma(2) = \sqrt{7,131.25 - 8 + 16} - 2^2$$

$$= 80.409$$

$$\gamma(3) = \sqrt{7,131.25 - 27 + 81} - 3^2$$

$$= 75.7659$$

$$\gamma(4) = \sqrt{7,131.25 - 64 + 256} - 4^2$$

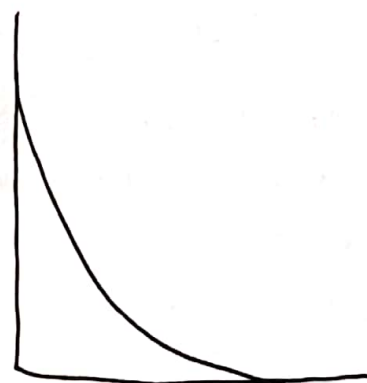
$$= 69.576$$

$$\gamma(5) = \sqrt{7,131.25 - 125 + 625} - 5^2$$

$$= 62.357$$

$$\gamma(6) = \sqrt{7,131.25 - 216 + 1296} - 6^2$$

$$= 54.6159$$



Funkst divergen wenn $t \rightarrow \infty = \infty$

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Soal a:

$$P''(t) - 18P'(t) + 81P = 405$$

$$P''(t) = \frac{d^2P}{dt^2} ; P'(t) = \frac{dP}{dt}$$

UTS Matematika Ekonomi 1

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$$a. P(t) = P_p + P_c$$

$$P_p: P''=0 ; P'=0$$

$$P_p: 81P = 405$$

$$P_p = 5$$

$$a_1 = -18$$

$$a_2 = 81$$

$$b = 405$$

$$\begin{aligned} a_1^2 &= 4a_2 \\ (-18)^2 &= 4(81) \\ 324 &= 324 \end{aligned}$$

$$\rightarrow r_1 = r_2 = -\frac{a_1}{b} = -\frac{-18}{2} = 9$$

$$P_c = A_1 e^{r_1 t} + A_2 t e^{r_1 t} = A_1 e^{9t} + A_2 t e^{9t}$$

$$P(t) = 5 + A_1 e^{9t} + A_2 t e^{9t}$$

$$b. P(0) = 5 + A_1 e^0$$

$$9 = 5 + A_1 e$$

$$A_1 e = 4$$

$$P'(0) = 9A_1 e^{9t} + A_2 e$$

$$26 = 9(4) + A_2 e$$

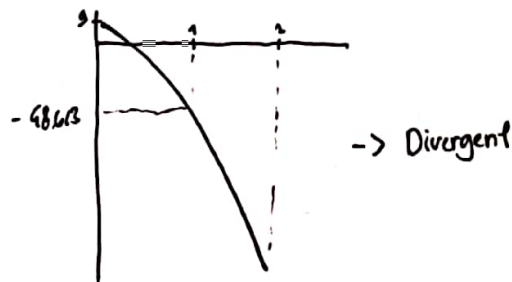
$$A_2 e = -10$$

$$P(t) = 4e^{9t} - 10te^{9t} + 5$$

$$c. P(1) = 4e^9 - 10e^9 + 5 = -6e^9 + 5 = -48613.50$$

$$P(2) = 4e^{18} - 20e^{18} + 5 = -16e^{18} + 5 = -1.050.554.501$$

$$P(3) = 4e^{27} - 30e^{27} + 5 = -26e^{27} + 5 = -1.38332593 \times 10^{13}$$



$$d. \lim_{t \rightarrow \infty} P(t) = 4e^{9t} - 10te^{9t} + 5 = 2e^{9t}(2 - 5t) + 5$$

Divergent karena $\lim_{t \rightarrow \infty} e^t = \infty$