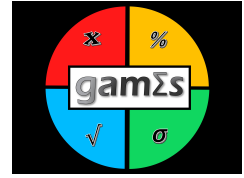


GAMES Practice Problem Solutions – Optimization



1. (a) See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
 (b) See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
 (c) See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
 (d) See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
 (e) See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
2. $h = 12.5$
3. (a) $\pi = \left(-792.6 + 4n - \frac{n^{3/2}}{20}\right)(1500) - 200n$ take the derivative and solve for $n = 2657.6$
 (b) The optimal quantity of potash would not change because only the constant changed.
4. (a) $\pi = P(Q)Q - zQ$, and taking the implicit derivative we have: $P'(Q)Q + P(Q) - z = 0$
 (b) $P'(Q^*)Q^* + P(Q^*) - z = 0$ becomes $Q' = \frac{1}{P''(Q^*)Q^* + 2P'(Q^*)}$
5. (a) $Q^* = \frac{\alpha - Q}{2}$
 (b) $\frac{dQ}{dz} = -1/2$
 (c) $\pi(Q) = (\alpha - Q + s)Q - zQ$ take the derivative w.r.t. Q and solve for Q : $Q^* = \frac{\alpha - z + s}{2} = \alpha - z$, solve for s , $s = a - z$
6. (a) Critical points occur when $x = \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$
 (b)

$$(a) f'(x) = \frac{16(2x^2+1) - 4x(16x)}{(2x^2+1)^2} = \frac{16(2x^2+1-4x^2)}{(2x^2+1)^2}$$

$$\frac{16(2x^2+1-4x^2)}{(2x^2+1)^2} = 0 = \frac{16(-2x^2+1)}{(2x^2+1)^2}$$

diff. of squares factor

$$0 = -16(2x^2-1)/(2x^2+1)^2$$

$$0 = -16(\sqrt{2}x-1)(\sqrt{2}x+1)/(2x^2+1)^2$$

Critical points: $\sqrt{2}x-1=0$ $\sqrt{2}x+1=0$

(a) $x = \frac{1}{\sqrt{2}}$ critical points $x = -\frac{1}{\sqrt{2}}$

(b)

	$-\infty$	$-\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	∞
-16		⊖	⊖	⊖
$(2x^2+1)^2$		⊕	⊕	⊕
$\sqrt{2}x-1$		⊖	⊖	⊕
$(\sqrt{2})x+1$		⊖	⊕	⊕
$f'(x)$		⊖	⊕	⊖

↙ min
↘ max

(c)

(d)

7. (a) See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (b) See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (c) See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (d) $Q=100$. See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (e) Between 19 and 20 units and again between 147 and 148 units of output, Q . See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (f) More output is needed to reach the first breakeven point, profit is maximized at an output of 97 units and profit is less. See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
8. (a) See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (b) See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (c) $Q \approx 72, Q \approx 178$. See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"
 - (d) $Q \approx 129$ Profit is \$4,603.82 when $Q \approx 130$. See "GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel"

- (e) Between 40 and 41 units of output and again when $Q=200$. See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”
- (f) More output is needed to reach the first breakeven point, profit is maximized at an output of $Q \approx 140$ units and profit is only \$2,347.61. See “GAMES-Optimization-PracticeQuestionSolutions.xlsx for the solution in Excel”



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