CS 4730 Algorithmic Game Theory

Homework #7
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Answers to homework problems:

1. For 0<= a <= 1, Nash flow = a
    For a > 1, Nash flow = 1/a

2. For 0<= a <= 1, total latency of a Nash flow = a
    For a > 1, total latency of a Nash flow = 1

3. For 0<= a < 1,
    $x_H{}^{Opt} = 1$
    $x_L{}^{Opt} = 0$

    $L = x_H * ax_H + x_L$
    $L = ax_H{}^2 + 1 - x_H$
    $d/dx(L) = 2ax_H - 1 = 0$
    For a >= 1,
    $x_H{}^{Opt} = 1/2a$
    $x_L{}^{Opt} = 1 - 1/2a$

4. For 0<= a < 1, L = a

    $L = 1/2a * a/2a + 1 - 1/2a$
    For a >= 1, L = 1 - 1/4a

5. $PoA(G^{a >= 0}) = 1/ (1 - 1/4a)$ where a = 1
    $PoA(G^{a >= 0}) = 4/3$

6. $PoA(G^{a >= 2}) = 1/ (1 - 1/4a)$ where a = 2
    $PoA(G^{a >= 2}) = 8/7$