% using the symbolic computation to solve algebraic equation

f = sym('3\*8+2\*(exp(2+log(PL))+exp(2.5+log(2/(1-0.7/0.4\*(PL-2)/PL)))+exp(3+log(2/(1-0.7/0.1\*(PL-2)/PL))))-3\*exp(2+log(PL))\*PL-2\*(exp(2.5+log(2/(1-0.7/0.4\*(PL-2)/PL)))-exp(2+log(PL)))\*2/(1-0.7/0.4\*(PL-2)/PL)-(exp(3+log(2/(1-0.7/0.1\*(PL-2)/PL)))-exp(2.5+log(2/(1-0.7/0.4\*(PL-2)/PL))))\*2/(1-0.7/0.1\*(PL-2)/PL)');

% generate the solution

PL = solve(f, 'PL')

PL = double(PL(2));

% assign values to parameter

F = 8;

MC = 2;

CL = log(4.9);

CM = log(6.9);

CH = log(14.4);

a = -0.6;

b = -0.4;

c = -0.2;

% compute other variable

QL = exp(CL+log(PL));

QM = exp(CM+log(MC/(1-a/b\*(PL-MC)/PL)));

QH = exp(CH+log(MC/(1-a/c\*(PL-MC)/PL)));

PM = MC/(1-a/b\*(PL-MC)/PL);

PH = MC/(1-a/c\*(PL-MC)/PL);

%plot the quantity-price graph

line([0 QL], [PL PL]);

line([QL QM],[PM PM]);

line([QM, QH],[PH PH]);

line([QL QL],[PL PM], 'LineStyle', ':');

line([QM QM],[PM PH], 'LineStyle', ':');

line([QH QH],[2 PH], 'LineStyle', ':');

text(QL,PL, sprintf('(%4.2f, %4.2f)', QL, PL));

text(QM,PM, sprintf('(%4.2f, %4.2f)', QM, PM));

text(QH,PH, sprintf('(%4.2f, %4.2f)', QH, PH));

xlabel('water demand ( m^3/month )');

ylabel('water price ( yuan/m^3)')