2. The following is a table showing Dana's marginal benefit from purchasing bottles of water and good X from a grocery store.

Quantity of Water (in bottles)	Marginal Benefit of Water (in dollars)	Quantity of Good X (in units)	Marginal Benefit of Good X (in dollars)
1	24	1	24
2	18	2	18
3	12	3	12
4	6	4	6
5	3	5	3

(a) What is Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X? <u>Show your work</u>.

(b) Assume the price of a unit of good X is $5. Calculate the total consumer surplus if Dana purchases 3 units of good X. <u>Show your work</u>.

(c) Now assume the price of a bottle of water is $3 and the price of a unit of good X is $6. Dana spends her entire budget of $30 on bottles of water and good X.

  (i) Explain why Dana does not maximize her benefit when she purchases 2 bottles of water and 4 units of good X. Use marginal analysis to explain your answer.

  (ii) What are the optimal quantities of good X and bottles of water at these prices?

  (iii) Suppose the price of a unit of good X drops to $3. Calculate Dana's cross-price elasticity of demand for bottles of water with respect to the price of good X, and state whether the two goods are substitutes or complements. <u>Show your work</u>.

Dee's Pizzeria

		Enter	Stay Out
Patrick's Pie	Advertise	$50, −$2	$175, $0
	Do Not Advertise	$150, $15	$100, $0

3. Patrick's Pie is currently the only pizzeria in College Town. It can either advertise or not advertise. Dee's Pizzeria is contemplating whether to enter or stay out of the College Town market. Each pizza establishment independently and simultaneously makes its decision. The payoff matrix above shows the profits for each combination of decisions, and both players have complete information. The first entries in the payoff matrix are Patrick's profit, and the second entries are Dee's profit.

(a) What actions maximize the combined total profits for Patrick's Pie and Dee's Pizzeria?

(b) Conditional on your response in part (a), does either Patrick's Pie or Dee's Pizzeria have an incentive to cheat on this combination of actions that maximize the combined total profits? Explain using numbers from the matrix for each pizzeria.

(c) Does Patrick's Pie have a dominant strategy?

(d) Identify the Nash equilibrium or equilibria actions for this game.

(e) Ignoring antitrust considerations, suppose that Patrick pays Dee's Pizzeria $20 if Dee chooses to "Stay Out."

   (i) Redraw this matrix including players, actions, and payoffs, showing how Patrick's Pie payment to Dee affected the payoffs.

   (ii) Identify the Nash equilibrium for the redrawn matrix.

STOP

END OF EXAM

Question 2

5 points (1 + 1 + 3)

(a) 1 point:

- One point is earned for calculating Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X as $66 and for showing the work.

    $24 + $18 + $24 = $66 OR $42 + $24 = $66

(b) 1 point:

- One point is earned for calculating Dana's total consumer surplus from purchasing 3 units of good X as $39 and for showing the work.

    ($24 – $5) + ($18 – $5) + ($12 – $5) = $39 OR $54 – $15 = $39

(c) 3 points:

- One point is earned for explaining that Dana does not maximize her benefit because the marginal benefit per dollar spent on bottles of water is greater than the marginal benefit per dollar spent on good X.

    (18/$3 > 6/$6; OR 6 > 1; OR 6≠1; OR $MB_w/P_w > MB_x/P_x$)

- One point is earned for stating that the optimal quantities of good X and bottles of water are 3 units and 4 bottles respectively.

- One point is earned for correctly determining the optimal quantity of water, calculating the cross-price elasticity of demand for bottles of water with respect to the price of good X, showing the work, and for stating that the goods are complements. Answer must be consistent with (c)(ii).

    (% change in the quantity of bottles of water)/(% change in the price of good X)
    = (25%/–50%) = –0.5

(Using the midpoint formula is also acceptable: (1/4.5)/(–3/4.5) = –0.33)