Econ 172A, Fall 2010: Quiz 2 Answers

Below (D'_t) refers to the dual of (P') and (D_t) to the Dual of (P). [The novelty of the question is that what I call (D) or D') are not duals of the given problems because of the omitted non-negativity constraint.]

Form 1 answers:

1. True: Feasible set is larger for (P').

2. False: (D_t) and (D'_t) may be infeasible and (P') could be unbounded. Example: $A = -1$, $b = b' = -1$, $c = 1$. (D) has solution $(y = -1)$. (D_t) and (D'_t) are not feasible. (P) and (P') are unbounded.

3. True: (D) not feasible implies that (D_t) is not feasible (more constraints) implies that (D'_t) is not feasible (same feasible set as (D_t))) implies that (P') has no solution.

4. False: Among other things, wrong objective function.

5. False: (P) may be unbounded. Try $\max 2x_1 - x_2$ subject to $x_1 - x_2 \le 0$, $x_1, x_2 \ge 0$. Check that (D) is not feasible.

6. True: Bigger feasible set for (P').

7. False: This would be true without the non-negativity constraint, but not here. Example: (P) is $\max x_2$ subject to $x_1 + x_2 \le 2$ and $x_1 - x_2 \le 0$ and $x \ge 0$. The solution is $x^* = (0, 2)$, $c \cdot x^* = 2$. (D) is $\min 2y_1$ subject to $y_1 + y_2 \ge 0$, $y_1 - y_2 \ge 1$. Solution $y^* = (.5, -.5)$. The equation $c \cdot x^* = y^* A x^*$ does not hold.

8. False: (D) could be unbounded. Example: $b = b' = -1$, $c = 0$, $A = 1$.

Form 2 Answers

1. False: Among other things, the objective function is not right.

2. False: May have (D) unbounded and (P') not feasible.

3. True: Same feasible set.

4. False: (D'_t) may be infeasible (so that (P') has no solution). (For example, constraint set of (D) is $-y \ge 1$.)

5. False: Lowering c to c' may make (D'_t) feasible.

6. False: (P) may be unbounded.

7. False: Less than or equal.

8. False: See Form 1, 7.

Form 3 Answers

1. False: See Form 1, 7.

2. False: (D') lacks non-negativity constraints.

3. False: (D'_t) may not be feasible.

4. False: (P') has more stringent constraints. It may be infeasible.

5. False: (D'_t) may be infeasible and then (P) will be unbounded.

6. True: (D') not feasible means (D'_t) and (D_t) are not feasible, so (P) has no solution.

7. False: Among other things, (P') could be unbounded.

8. True: (P) has larger feasible set so solution to (P') is feasible for (P).