Let me make my words clear so that you can follow what I mean here (I did not change anything in the following, I am just break down what I mean in my proof, you may misunderstand my language):

a)

We know that for the problem to be bounded, we should have

I agree that for the problem to be unbounded, there should be at least one entry of to be negative. But here I said , the is the general inequality (in this class I did not see any use of the curly inequality so I just follow the convention), so it renders it is a partially comparison. It might be trivial to see that A has to be PSD here (which is the reason why I did not write it down).

It can be easily seen that, since for the primal problem, for it to be unbounded, gives the optimal value. To be so, therefore, for the first constraint , has to be PSD otherwise . Therefore:

Again, here is the general inequality.

However:

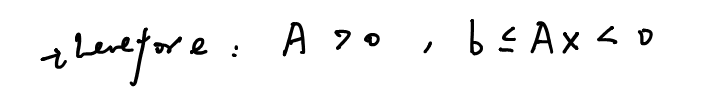
Therefore, the above two violates each other, we conclude that for primal to be unbounded, the dual will be infeasible.

b)

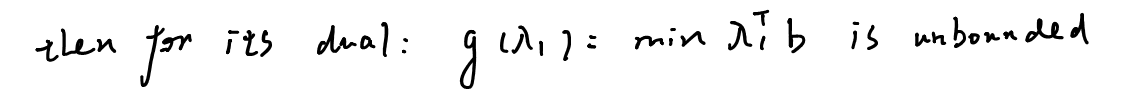
I am just listing all possible cases for the primal to be infeasible. Since there are two constraints here, there will be three possible cases:

1. and
2. and
3. and

In my assignment I am just listing the discussion for different cases. From a) we know that (again, general inequality). And if any of the case above makes the dual infeasible, this problem is proved. Say for case 1, since :



Therefore (general inequality), the dual is unbounded where



For question 6, you are right that I should be more clear on stating that since Slater’s conditions and convexity holds, the strong duality holds (it is just trivial so that I neglect it). But I do have a concern on your marking scheme. Since all part a) b) and c) you deduct the grade all because of the same mistake, should you just deduct the grade once? I think it is not very reasonable within one question you remove the grades multiple times because of the initial mistake (here is just missing the statement, which I agree is important). Unless you do this to all other people, then it is fair to me.