Linear Programming

Warning: The hard deadline has passed. You can attempt it, but **you will not get credit for it**. You are welcome to try it as a learning exercise.

To specify an array or sequence of values in an answer, you must separate the values by a single space character (with no punctuation and with no leading or trailing whitespace). For example, if the question asks for the first ten powers of two (starting at 1), the only accepted answer is:

1 2 4 8 16 32 64 128 256 512

If you wish to discuss a particular question and answer in the forums, please post the entire question and answer, including the seed (which is used by the course staff to uniquely identify the question) and the explanation (which contains the correct answer).

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Question 1

(seed = 888220)
Which of the following constraints can be modeled using linear programming?

☐ x1, x2, x3, x4 <= 0

☐ | x1 + 2x2 + 3x3 + 4x4 | >= 10.

☐ 16 (x1)^2 <= 20

☐ (x1)^2 + (x2)^2 + (x3)^2 <= 10

☐ (x1 + 2x2 + 3x3 + 4x4) / (5 + 5x5 + 6x6) <= 10, where all variables are nonnegative.

Question 2

(seed = 924800)
Consider the following linear programming simplex tableaux with 3 equations and 8 variables:

```
    maximize Z
     +  5/2 x0  +    1 x1            -  5/3 x3                     -    8 x6  +  7/2 x7    -  Z    = -276
    ---------------------------------------------------------------------------------------------------
     -    5 x0  -  3/2 x1            +    5 x3            +    1 x5  -    3 x6  +    1 x7           =   30
     -    5 x0  +    7 x1            -  2/5 x3  +    1 x4            -  6/5 x6  +  2/5 x7           =   54
     -  8/5 x0  -    3 x1  +    1 x2  +  2/5 x3                     -  5/3 x6  -    2 x7           =   42
            x0  ,      x1  ,      x2  ,      x3  ,      x4  ,      x5  ,      x6  ,      x7          >=    0
```

Which variable could be the next to *enter* the basis? Check all that apply.

☐ x0

☐ x1

- [ ] x2
- [ ] x3
- [ ] x4
- [ ] x5
- [ ] x6
- [ ] x7

Question 3

(seed = 412420)
Consider the following linear programming simplex tableaux with 5 equations and 9 variables:

maximize Z

```
                      -    4 x2  +  5/2 x3  -  5/2 x4            -    5 x6                        -  Z    = -228
    ------------------------------------------------------------------------------------------------------------
                      -  5/3 x2  -    1 x3  -  3/4 x4            +  7/4 x6  +    1 x7                     =   24
     +    1 x0        -    2 x2  -   10 x3  +  1/2 x4            -    2 x6                               =    6
                      -    4 x2  +    6 x3  +  3/2 x4  +    1 x5  +    3 x6                               =   60
            +    1 x1  -    3 x2  +    8 x3  +    3 x4            +  5/4 x6                               =   60
                      +  3/5 x2  +    1 x3  +    5 x4            +  1/3 x6            +    1 x8           =   24
          x0  ,      x1  ,      x2  ,      x3  ,      x4  ,      x5  ,      x6  ,      x7  ,      x8          >=    0
```

Suppose that variable x3 is the variable chosen to enter the basis.
Which variable could be the next to *leave* the basis? Check all that apply.

- [ ] x0
- [ ] x1
- [ ] x2
- [ ] x3
- [ ] x4
- [ ] x5
- [ ] x6
- [ ] x7
- [ ] x8

- [ ] **In accordance with the Coursera Honor Code, I (Atul Gupta) certify that the answers here are my own work.**

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You cannot submit your work until you agree to the Honor Code. Thanks!