

MATH 407 FINAL EXAM SAMPLE QUESTIONS

1. A farmer has three farms. He can grow three different crops on them. Data for the coming season are given in the table below. To maintain a uniform work load among the three farms, the farmer adopts the policy that the percentage of usable acreage planted must be the same at each of the three farms. However, any combination of the crops may be grown at any of the farms. The only expenses the farmer counts are for the water used at the various farms. How much acreage at each farm should be devoted to the various crops to maximize the farmer's net profit?

<i>Farm</i>	<i>Usable Acreage</i>	<i>Water Available in a-ft at \$25/a-ft</i>	<i>Cost per a-ft of Water Beyond Amounts in Previous Column</i>
1	400	1200	\$50
2	600	2200	\$60
3	450	1100	\$70

<i>Crop</i>	<i>Maximum Acreage Farmer Can Plant</i>	<i>Water Consumption (a-ft/a)</i>	<i>Yield units/a</i>	<i>Selling Price per Unit</i>
A	500	6	50	\$25/unit up to 10,000 units \$20/unit beyond 10,000 units
B	700	5	100	\$15/unit up to 40,000 units \$8/unit beyond 40,000 units
C	350	4	75	\$45/unit up to 20,000 units \$42/unit beyond 20,000 units

3. Compute the dual LP to the following LP **without first converting to standard form.**

$$\begin{array}{rll} \text{maximize} & & 3x_2 - 30x_3 + x_4 \\ \text{subject to} & x_1 - x_2 + x_3 - x_4 = & 0 \\ & x_1 + 5x_3 - 3x_4 \leq & 5 \\ & -2x_1 + 5x_2 + x_3 - 5x_4 = & -1 \\ & & 0 \leq x_1, 0 \leq x_2 \end{array}$$