Name (Please Print) ______________________________

Your Signature ______________________________

This is a closed book exam. Maximum possible score is 60. There are four problems. **Show all your work.** *Partial credit will be given for partial solutions. Correct answers with insufficient or incorrect work will not get any credit.*

Score

1. (15)	
2. (15)	
3. (15)	
4. (15)	
Total. (60)	

Number of sheets attached: ______________________________

Please attach this sheet as the first page of your answer booklet.

March 2008 **Name (Please Print)** ____________________

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1. Given a weight $\alpha \in (0,1)$, solve the following maximisation problem:

$$\begin{array}{rc} \text{Maximise} & \alpha x_1 y_1 + (1-\alpha) x_2 y_2 \\ \text{Subject to} & x_1 + x_2 \leq 10 \\ & y_1 + y_2 \leq 5 \\ & x_1 \geq 0, y_1 \geq 0, x_2 \geq 0, y_2 \geq 0 \end{array}$$

Justify your answer and if you are using any Theorem, clearly show why that Theorem is applicable.

2. Solve the following maximisation problem:

$$\begin{array}{rc} \text{Maximise} & \frac{\sqrt{x_1}}{2} + \frac{\sqrt{x_2}}{4} \\ \text{Subject to} & x_1 \geq 0 \\ & x_2 \geq 0 \\ & x_1 + x_2 \leq 1. \end{array}$$

Justify your answer and if you are using any Theorem, clearly show why that Theorem is applicable.

3. Solve the following minimisation problem:

$$\begin{array}{rc} \text{Minimise} & x_1^2 + x_2^2 \\ \text{Subject to} & (x_1 - 1)^3 - x_3^2 = 0. \\ & x_1, x_2, x_3 \in \mathbb{R} \end{array}$$

Justify your answer and if you are using any Theorem, clearly show why that Theorem is applicable.

4. Let $n \in \mathbb{N}$. Using the Lagrangian Method solve the following maximisation problem:

$$\begin{array}{rc} \text{Maximise} & \sum_{i=1}^{n} x_i \\ \text{Subject to} & \sum_{i=1}^{n} x_i^2 = 1 \\ & x_i \in \mathbb{R} \end{array}$$