

HOMEWORK 3 MA 492
DUE NOV. 12

Solutions are graded on WORK/METHOD/REASONING and not on your final numerical answer, so please justify your steps! Answers to book problems are in the back of the book. You may refer to these BEFORE your write-up, but not DURING. The same applies to any help from classmates or the internet. Remember, 1/2 the exam problems (for MA 492) will be very similar to book problems, and you will NOT be able to use the book during exams.

Book problems:

Ch. 6: 2, 4, 5, 7, 8, 12, 13.

Lagrange Multipliers:

Maximize $f(x, y, z) = x + z$ subject to the constraint $x^2 + y^2 + z^2 = 1$.

Maximize $f(x, y) = x^2 + y^2$ subject to the constraint $y - x = 1$.

Extra problems for MA 592 students:

Book 6.1, 6.3, 6.9, 6.10, 6.14

If X is a Binomial(n, p) random variable,

- find $\mathbf{E}(X^k)$ for all $k \in \mathbb{N}$
- Show that

$$\mathbf{E}\left(\frac{1}{X+1}\right) = \frac{1 - (1-p)^{n+1}}{np + p}$$

- What value of p maximizes $P(X = k)$. This is called the *maximum likelihood estimator* for the event $\{X = k\}$.