Math 135 – Preparation for Calculus – Group Project 1 – F'15 – Prof. Janeba

Goals:

- To model a realistic event that is not quite a routine homework exercise.
- To gain experience with extended problems.
- To gain experience working formally with groups.
- To practice communicating and explaining mathematical results about functions and models clearly and professionally.

The City of Middleburg proposes to build an off-leash dog exercise enclosure in its main city park. On the advice of the Middleburg Dog Club, the suggested configuration is as follows:

The enclosure will be a rectangle with an internal divider separating the enclosure into two areas (one for "big dogs" and one for "small dogs"); the divider will be made of a section of fence that will be installed parallel to one of the rectangle's sides. The city has budget to install 2100 feet of chain link fence to make the sides and divider of the enclosure.

The rectangle can be at most 700 feet long on its longest side, as otherwise the enclosure would not fit inside the existing park. The city would also like the "small dog" area to have ¼ the area of the "big dog" area. The city would like the largest possible total area for the enclosure, given the amount of available fence. Other than those criteria, the city has no preferences about how the enclosure should be designed.

Your job, as landscape architecture consultants, is to advise the city of the design configuration for the enclosure that best meets these criteria. Please present your report in two parts: an executive summary with the conclusions and the design you propose, and a technical appendix for the city budget department that shows why your design is in fact the best possible design given the parameters given above. Note that your appendix must go far, far beyond a series of calculations, as it must include an entire explanation of how and why you set up your calculations as you did, as well as a review of the relevant geometry and mathematics. (We don't like to put this in print, but the politics of city budget have gotten very acrimonious lately. Your appendix must stand alone – i.e. without someone to explain it further – even for readers who would deeply like to disagree with your conclusions. Convince even them, through your thoroughness and detail of explanation, that your conclusion is indeed the best one.)

Your conclusions AND the appendix should both be formed into a coherent narrative, rather than a bullet-point list of calculations. Of course you will want to present these results in multiple formats, including a graphical format and a symbolic calculation format.

Report guidelines:

Preliminary report: Your group will submit an initial written (typed) report by 4 p.m Thursday, October 8, at the Middleburg Mathematical Analysis Department, room 216, Ford Hall. At a minimum, your preliminary written report will present a mathematical model that shows the options allowed (there are infinitely many) and the resulting enclosure area for each. Both a symbolic (algebraic) and graphical representation will be in your preliminary report. Finally, an explicit plan for how you will proceed to the problem's conclusion will be given.

Final report due: Thursday, October 15, at 4 p.m. at the MMAD office, Ford 216.
Late papers will not be accepted.

Other guidelines:
Present your professionally written report to the MMAD office, carefully printed on plain white paper fastened with a staple. You must also submit an electronic version of your report to your instructor via email. Use Microsoft Word or other suitable word processor. Equations will be typed, using for example the Microsoft Equation Editor built into Word. Graphs that include proper axis labels can be carefully hand-drawn on the report pages OR made using Microsoft Excel, or similar, and electronically inserted into your document. On the front page, team member's names will be clearly visible.
The report will be self-contained, i.e. the reader will not need prior knowledge or understanding of the problem to understand your report. Your calculations and conclusions will be explained in detail, as befits a professional report on a topic of public interest. Your audience consists primarily of non-mathematician government officials, and quite possibly the Middleburg public as well, since this study will be made public in Middleburg. Relatively few of your readers will be fluent in the mathematical concepts used; explain accordingly. Your explanation and presentation are as important as the mathematics, but of course your mathematical analysis must be sound, complete, and correct. It should go without saying that your grammar, punctuation, and spelling will be flawless.

Group evaluation: Your group turns in one report and everyone in the group gets the same grade. To provide some accountability, however, every group member is required to submit to their instructor an informal group evaluation. Handwritten, typed, or email are OK. The evaluation should include (just!) a few sentences about how well the group worked together. The evaluation **must include** your estimate of the share of the project work that you feel each group member did, expressed as a percentage (e.g. 33%/33%/33% or 40%/30%/30%, etc.). **These percentages must add to 100%.** These evaluations will be held in confidence, and used at the end of the semester, if necessary, to adjust final grades.

A word to the wise: This project counts for about 5% of your final grade. Please make sure that your report's qualities of completeness, clarity, and correctness reflect your best abilities. Please carefully read ***all*** the instructions and resources provided.