CMPSCI 145 Fall 2009
Midterm Exam, Take Home Portion
Professor William T. Verts

Write your answers into a word processor such as Microsoft Word. Use 12-point Times Roman for all your text, single spaced, and fully-justify all paragraphs. Write a one-half-page to one-page essay on each topic. Make certain that your name is typed onto all pages, and staple multiple page answers together. Turn in the printed document to me in class on or before Friday, November 13.

<8> **15 points – Essay Question.** Describe in some detail how 1's complement and 2's complement binary representations correspond to 9's complement and 10's complement decimal representations. In particular, describe how 1's and 9's complement occupy the same "mental space" for their respective bases, as do 2's and 10's complement. In other words, when you think about how to ***negate*** a number, how are the mathematical actions of performing a 1's complement negation in binary similar to the mathematical actions of performing a 9's complement negation in decimal? How is performing a 2's complement negation in binary mathematically similar to performing a 10's complement negation in decimal? Do not forget to consider unsigned and signed overflow.

5 points extra credit if you can ***correctly*** include how BCD and XS3 factor in to this discussion of representations.

<9> **15 points – Essay Question.** Describe how changing the representation in a problem can lead to a different understanding of the solution, or to a different set of capabilities. Use specific examples from some of the assignments and demonstrations shown in class (such as the Z99 spreadsheet assignment, the symbolic representation of π versus the numeric representation of π, symbolic transformation rules such as "replace $\cos(\pi/2)$ with 0" or "replace the square root of the square of x with x, for any x," the implicit versus parametric representations of lines, parabolas, and Bézier curves, etc.).