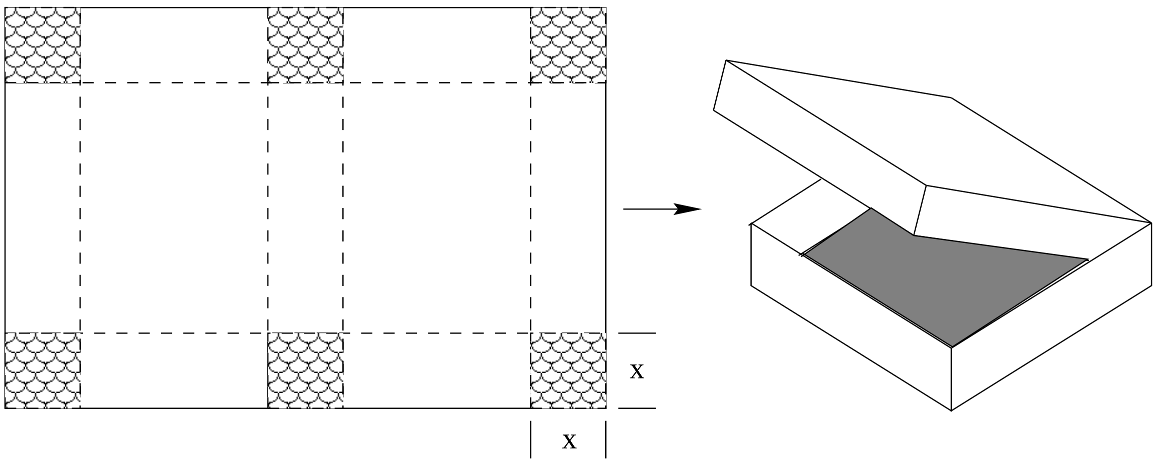
Name________________________ **Student Id:**________________________

Math 120, Section A **Quiz 3** **23 October 1997**

Instructions: You have 30 minutes for this quiz. Show all of your work.

Problem Description: You have been hired to design gift boxes. The boxes are to be constructed from a single sheet of cardboard. The cardboard is measured in inches, and it is 80 inches wide by 150 inches long. You cut out certain x by x squares, then you fold the cardboard into your box. Your diagram below shows your layout for cutting and folding the cardboard.



1. (6) Find a model that describes the volume of the box as a function of $V(x)$, where x is the length of your square cuts.

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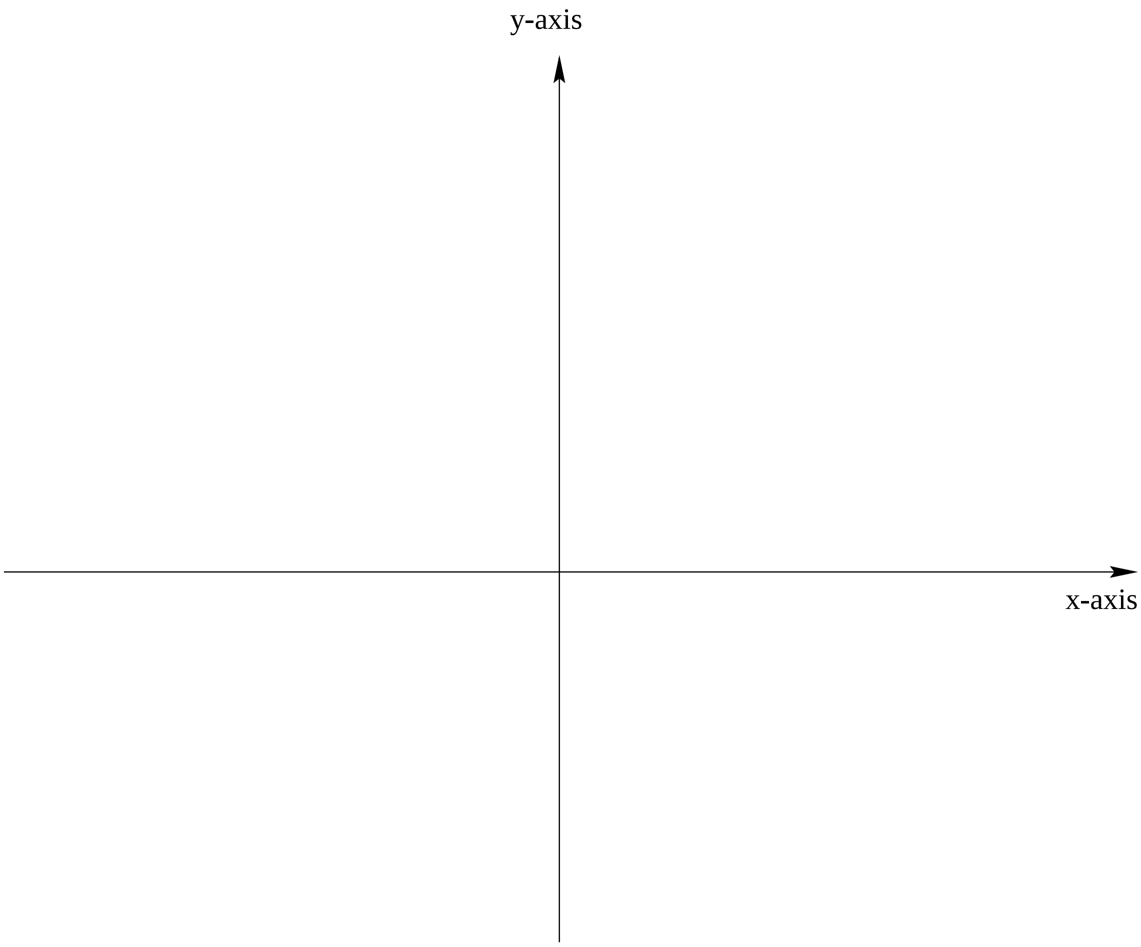
2. (2) What **function arithmetic** did you use to construct $V(x)$?

3. (4) Sketch $V(x)$ on the coordinate system below.



4. (4) What are the zeros of $V(x)$?

5. (4) $V(x)$ describes the volume of your gift box. What is its domain? Explain your answer.

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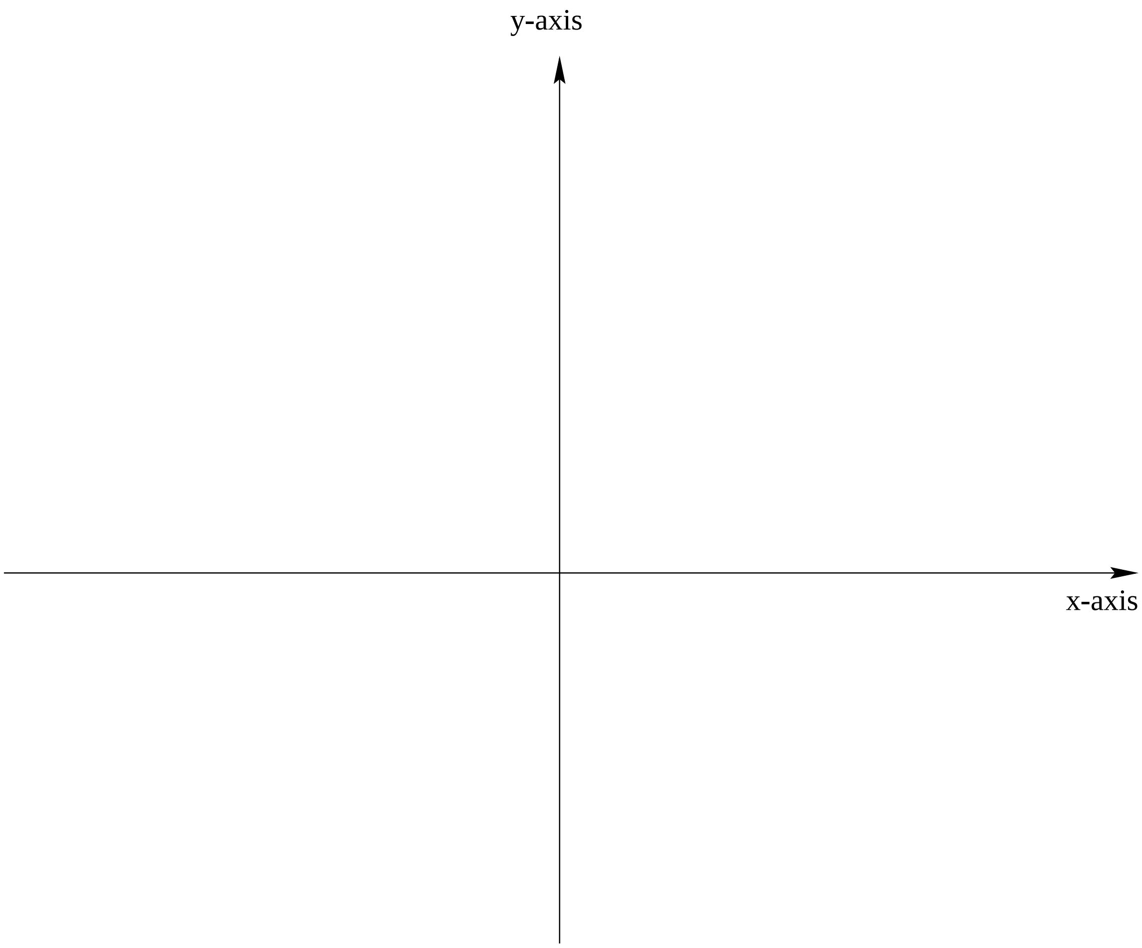
6. (4) Suppose you know that at $x \approx 14.7$ inches you get a maximum volume of approximately $39,385\,\mathrm{in}^3$. Sketch a graph of $V(x)$ for your domain. Show graphically how to find the cut or cuts you could make to construct a box of volume $20,000\,\mathrm{in}^3$.



7. (2) How many ways can you construct a box with a volume of $20,000\,\mathrm{in}^3$?

8. (4) Qualitatively describe the box or boxes you would construct with a volume of $20,000\,\mathrm{in}^3$.