An open box is made by cutting squares $x$ inches on a side from the four corners of a sheet of cardboard that is 20” x 34” and then folding up the sides.

1. Express the volume of the box as a function of $x$.
   $v(x) = (20-2x)(34-2x)(x)$

2. What is the domain of the volume function?
   $[0,10]$ or $(0,10); 0 \leq x \leq 10$ or $0 < x < 10$.

3. Estimate the value of $x$ that maximizes the volume of the box. Explain how you got your answer.
   $x \approx 4$. Use the trace key on the calculator or the Maximum function.

4. What is the range of the volume function?
   $[0, 1248]$ or $(0, 1248)$ or $0 \leq v(x) \leq 1248$ or $0 < v(x) < 1248$.

5. List all the $x$-intercepts of the volume function. What is the physical interpretation of an $x$-intercept in this context?
   $x = 0, x = 10, x = 17$. At the roots of the volume function (i.e., the $x$-intercepts) the volume of the box is zero.

6. List all the $y$-intercepts of the volume function. What is the physical interpretation of a $y$-intercept in this context?
   $y=0$ is the $y$-intercept. At $x=0$ (the $y$-intercept) no square is cut out, the box has no depth.

7. Is the volume function an even function? Justify your answer.
   No, $v(x)$ is neither even nor odd. It is not symmetric with respect to the $y$-axis. Also $v(-x) \neq v(x)$ for instance $v(2) = 960$ but $v(-2) = -1824$. Indeed, the volume function evaluated on any negative number gives a negative number, and the volume function evaluated between $x=0$ and $x = 10$ gives a non-negative number.
8. What degree polynomial is the volume function?
The volume function is a third degree polynomial.

9. If we were to write the polynomial of the volume function in the form
   \[ a_0 + a_1 x + a_2 x^2 + \ldots + a_n x^n, \] what would the constant term \( a_0 \) be?
   \[ a_0 = 0. \]

10. How would you draw the graph of \( w(x) = v(x) + 2 \) if you knew what
    the graph of \( v(x) \) looked like? (Explain in terms of translations and dilations
    of the graph of \( v(x) \)).
   \( w(x) \) is just \( v(x) \) shifted up by 2 units.