No calculator is allowed for this page.

   I pledge that I will not give, accept, or tolerate others' use of unauthorized aid in completing this work. (Sign and also print your name)

Answer Key

1. A piece of cardboard that is 6×6 (each measured in inches) is being made into a box without a top. To do so, squares are cut from each corner of the box and the remaining sides are folded up (as we did on Thursday). **Suppose the box *has* to be at least 1 inch deep and no more than 2 inches deep.**

   For each question, circle one or more correct answers.

   (a) There is a maximum possible volume of the box.

   ~~True~~   False

   (b) There is a minimum possible volume of the box.

   ~~True~~   False

   By Extreme Value Thm, because $x(6-2x)^2$ is continuous on $[1,2]$

2. Next, consider a function
$$f(x) = 27x - \frac{x^3}{4},$$
   which has nothing to do with the previous cardboard box setup. Which of the following x-values are critical numbers of f? Circle all answers.

   $x = 0$ $x = 1$ $x = 2$ $x = 3$ **$x = 6$** $x = 27$ $x = \sqrt{108}$

   $x = -1$ $x = -2$ $x = -3$ **$x = -6$** $x = -27$ $x = -6\sqrt{3}$

   When you are finished, you can start reading the next page to get ready for the team quiz. The next page will not be graded.

(Note: this page will NOT be graded)

A piece of cardboard that is 6×6 (each measured in inches) is being made into a box without a top. To do so, squares are cut from each corner of the box and the remaining sides are folded up (as we did on Thursday). **Suppose the box *has* to be at least 1 inch deep and no more than 2 inches deep.**

   Make a sketch of the cardboard paper with the corners cut out. Choose a variable name (let's say, x) to represent the size of the length of the square that has been cut out, and put it into your sketch in the appropriate places. Write down a function using this variable (let's say, x) which gives a formula for the volume of the box.

1. Circle all choices below which are equal to your function.

    $4x^3 - 24x^2 + 36x$ $x(2x - 6)^2$ $-4x(6 - 2x) + (6 - 2x)^2$
    $(6 - 2x)(-6x + 6)$ $-(6 - 2x)(6x + 6)$

2. Compute the derivative of this function.
    Circle all choices below which are equal to the derivative.

    $4x^3 - 24x^2 + 36x$ $x(2x - 6)^2$ $-4x(6 - 2x) + (6 - 2x)^2$
    $(6 - 2x)(-6x + 6)$ $-(6 - 2x)(6x + 6)$

3. What are the critical numbers of your function from part (1)?
    Circle all possible choices below

    -6 -3 -2 -1 0 $\frac{1}{3}$ 1 $\frac{3}{2}$ 2 3 6