Here is COLLECTED Homework 1 !

Math 425: Homework 1, due in lab, 9/7

Fall 2021

Directions: This homework is due on 9/7 at the start of your lab. Late work will not be accepted. Each homework will be worth 10 points, and at least ONE of these points is awarded for "professionalism", meaning that your work is prepared suitably, according to the guidelines below.

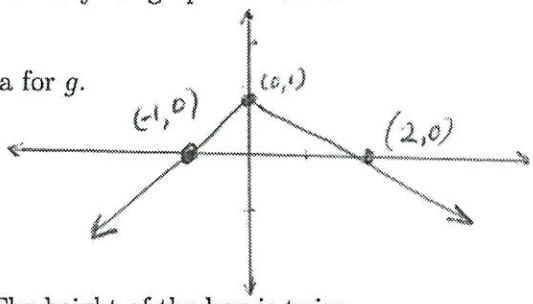
- Write your name and lab number at the top of your work.
- Label each problem clearly.
- Make sure that your work is clear.
- Leave blank space for comments from the grader.
- Staple your work.

1. Given the function

$$f(x) = \begin{cases} x+1, & \text{if } 0 < x \leq 2, \\ 3x, & \text{if } 2 < x < \infty. \end{cases}$$

   - What is the domain of f? Answer clearly and explain in 1 or 2 complete sentences.
   - Draw the graph of $y = f(x)$. Label several points on your graph. Indicate behavior of the graph as $x \to \infty$.

2. Given the sketch for the graph of $y = g(x)$, find a formula for g.



3. A shipping carton has a square base with side x inches. The height of the box is twice the side of the base. Assume that the box has a lid.

   - Draw a labeled sketch of the carton.
   - Write a formula for the surface area S of the box as a function of x. Write your answer as $S(x)$.
   - The base of the box is made of reinforced material, costing 10 cents per square inch. The sides and the lid are made of cheaper material, costing 5 cents per square inch. Write a formula for the cost C of the box, as a function of x. Write your answer as $C(x)$.

4. (the Calculus of Polynomials) The derivative, or "slope-producing function" for the function $f(x) = x^n$, is given by

$$f'(x) = nx^{n-1}.$$

You may assume that n is a positive integer.

- Find all values of x for which the tangent line for $f(x) = x^3$ is parallel to the line $y - 5x = 2$. Answer clearly and explain in one or two complete sentences.
- Is there any value of x for which the tangent line for $f(x) = x^3$ is parallel to the line $y = -4x + \pi$? Answer clearly and explain in one or two complete sentences.