Spring 2020 Math 337 - Lecture 10 Name _____

Note: For full credit you must show intermediate steps in your calculations. Your work must be your own. Copying or sharing solutions with others may subject you to disciplinary action based on the appropriate sections of the San Diego State University Policies.

1. (5pts) Consider the function $f(t)$ defined as follows:

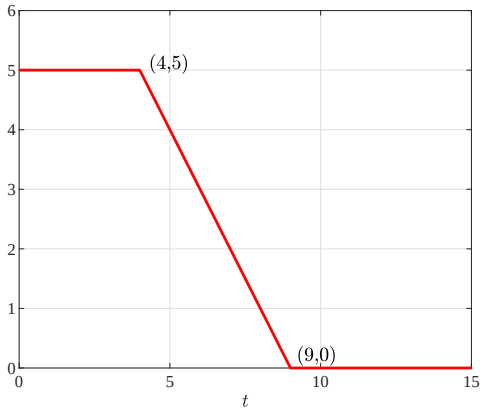
$$f(t) = \begin{cases} t^2 + 1, & 0 \le t \le 3, \\ 0, & t > 3. \end{cases}$$

Sketch a graph of this function and write it in terms of the *step function*, $u_c(t)$, which is defined in the lecture notes. Further, write the function with the step function so that every element is readily found in the Laplace table (https://jmahaffy.sdsu.edu/courses/s20/math337/hwprob/Reviews/Laplace Table.pdf). (Something like $u_c(t)\sin(t-c)$.) Finally, find the *Laplace Transform* of $f(t)$, $F(s) = \mathcal{L}[f(t)]$. (Slide 15-20 and Laplace Table)

2. (8pts) Solve the following initial value problem with *Laplace transforms*:

$$y'' + 2y' + 5y = f(t), \qquad y(0) = 1, \quad y'(0) = 4,$$

where $f(t)$ is pictured in the graph to the right. Use the *Laplace table* to find your solution. (Slide 18-20, and video example)



3. (3pts) Use the computer to create a graph of your solution for $t \in [0, 15]$. What is the limiting solution for large t? (Slide 20)