Name: _____ **Sort #:** _____

Worksheet 15: Laplace Transform of Step Functions

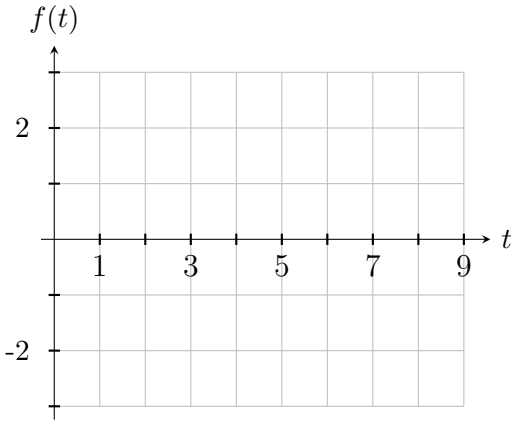
MATH 2310, Spring 2019 Grade: / 40

You are permitted to use technology to assist you with factoring and partial fraction decompositions. All other work should be done by hand. Solutions that do not have an appropriate amount of detail will not receive credit.

1. (a) (6 pts) Express the function

$$f(t) = \begin{cases} 0, & 0 \le t < 3 \\ -2, & 3 \le t < 5 \\ 2, & 5 \le t < 7 \\ 1, & t \ge 7 \end{cases}$$

in terms of the unit step function $u_c(t)$. Then, sketch the graph on the axes to the right.

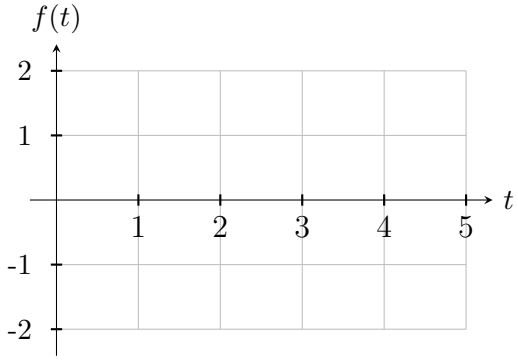


(b) (4 pts) Find the Laplace transform of $f(t)$

2. (a) (6 pts) Convert the function

$$g(t) = (t-3)u_2(t) - (t-2)u_3(t)$$

to piecewise function notation and sketch the graph on the interval $t \geq 0$.



(b) (4 pts) Find the Laplace transform of $g(t)$

3. (10 pts) Find the Laplace transform of $f(t) = \begin{cases} 0, & t < 1 \\ t^2 - 2t + 2, & t \geq 1 \end{cases}$

4. (10 pts) Find the Laplace transform of $g(t) = \begin{cases} 0 & t < 4 \\ 3\sin(\pi t), & 4 \le t < 5 \\ 0, & t \ge 5 \end{cases}$