

Show your work! Answers without supporting work will not be given credit. Print this assignment and write your work in the spaces provided.

1. Use the Heaviside unit step function to rewrite the following piecewise defined function.

$$f(t) = \begin{cases} 0 & t < 0 \\ 2 & 0 \leq t < 3 \\ 1 & 3 \leq t < 5 \\ 3 & 5 \leq t \end{cases}$$

2. Graph $f(t) = 2u_0(t) - (t-3)u_3(t) + (t-5)u_5(t)$.

3. Find the Laplace inverse of $Y(s) = \frac{e^{-2s}}{s^2 + s - 2}$.

4. Solve $y'' + 4y = \sin t + u_\pi(t) \sin(t - \pi)$, $y(0) = 0$, $y'(0) = 0$.

5. Solve $y'' + 3y' + 2y = u_2(t)$, $y(0) = 0$, $y'(0) = 1$.

6. Solve $y'' + y = u_{3\pi}(t)$, $y(0) = 1$, $y'(0) = 0$.

7. Solve $y'' + y' + \frac{5}{4}y = t - u_{\frac{\pi}{2}}(t)(t - \frac{\pi}{2})$, $y(0) = 0$, $y'(0) = 0$.