Math 240 - Assignment 11

Name _____

November 20, 2025

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due December 4.

1. Find the convolution of $f(t) = t$ and $g(t) = t^3$.

2. Use convolution to determine the inverse transform of $F(s) = \dfrac{1}{(s-1)(s+5)}$.

3. Suppose the Laplace transform of $g(t)$ exists. Use Laplace transforms to solve the initial value problem. Use convolution to write your final answer as an integral containing the function g. (Do any partial fraction decompositions by hand. They should be easy.)

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

4. Use Laplace transform methods to solve the following equation.

$$tx'' - tx' + x = 2, \quad x(0) = 2,\ x'(0) = -1$$

5. Let $f(x) = x$ on $(-\pi, \pi)$. Find the Fourier series for f.