Dr. Z.'s Calc5 Homework assignment 4

1. Compute $\mathcal{L}\{t \sin 2t\}$.

2. Compute (using Lecture 4's method!) $\mathcal{L}\{t^2 e^{2t}\}$.

3. Compute (using Lecture 4's method!) $\mathcal{L}\{t^3 e^{-t}\}$.

4. Evaluate

$$\mathcal{L}\{\int_0^t \tau e^{t-\tau}\, d\tau\} \quad .$$

5. Evaluate (using Lecture 4's method!)

$$\mathcal{L}\{\int_0^t \cos\tau\, d\tau\} \quad .$$

6. Use Laplace Transform to solve the following integral equation

$$f(t) = te^t + \int_0^t \tau f(t-\tau)\, d\tau \quad .$$

7. Use Laplace Transform to solve the following integral equation

$$f(t) + \int_0^t f(\tau)\, d\tau \;=\; 1 \quad .$$

8. Solve the initial value problem

$$y' + y = t\cos t \quad , \quad y(0) = 0 \quad .$$

Leave you answer in the form $\mathcal{L}^{-1}\{Y(s)\}$ for some $Y(s)$.