

1. 5 Use the method of Laplace Transforms to solve the initial value problem.

$$y'' + y = t^2 + 2, \quad y(0) = 1, \quad y'(0) = -1$$

$$s^2 Y - s + 1 + Y = \frac{2}{s^3} + \frac{2}{s} = \frac{2 + 2s^2}{s^3}$$

$$Y(s^2 + 1) = \frac{2(s^2 + 1)}{s^3} + s - 1$$

so

$$Y = \frac{2}{s^3} + \frac{s}{s^2 + 1} - \frac{1}{s^2 + 1},$$

giving

$$y(t) = t^2 + \cos t - \sin t.$$