

MTHSC 208 (Differential Equations)
Dr. Matthew Macauley
HW 14
Due Monday November 2nd, 2009

For full credit, be sure to *show your work* on all of these problems!

- (1) Transform the given initial value problem into an algebraic equation involving $Y(s) := \mathcal{L}(y)$, and solve for $Y(s)$.
- (a) $y'' + y = \sin 4t$, $y(0) = 0$, $y'(0) = 1$
 - (b) $y'' + y' + 2y = \cos 2t + \sin 3t$, $y(0) = -1$, $y'(0) = 1$
 - (c) $y' + y = e^{-t} \sin 3t$, $y(0) = 0$
- (2) Find the inverse Laplace transform of the following functions.
- (a) $Y(s) = \frac{2}{3 - 5s}$
 - (b) $Y(s) = \frac{1}{s^2 + 4}$
 - (c) $Y(s) = \frac{5s}{s^2 + 9}$
 - (d) $Y(s) = \frac{3}{s^2}$
 - (e) $Y(s) = \frac{3s + 2}{s^2 + 25}$
 - (f) $Y(s) = \frac{2 - 5s}{s^2 + 9}$
- (3) Find the inverse Laplace transform of the following functions.
- (a) $Y(s) = \frac{s}{(s + 2)^2 + 4}$
 - (b) $Y(s) = \frac{3s + 2}{s^2 + 4s + 29}$
 - (c) $Y(s) = \frac{2s - 2}{(s - 4)(s + 2)}$
 - (d) $Y(s) = \frac{3s^2 + s + 1}{(s - 2)(s^2 + 1)}$
- (4) Use the Laplace transform to solve the following initial value problems.
- (a) $y' - 4y = e^{-2t}t^2$, $y(0) = 1$
 - (b) $y'' - 9y = -2e^t$, $y(0) = 0$, $y'(0) = 1$.