Indian Institute of Science

E9−252: Mathematical Methods and Techniques in Signal Processing

Instructor: Shayan G. Srinivasa

Homework #0, Fall 2017

Late submission policy: Points scored = Correct points scored $\times e^{-d}$, $d = \#$ days late

Assigned date: Aug. 21$^{\text{st}}$ 2017 $\qquad\qquad$ **Due date**: Aug. 28$^{\text{th}}$ 2017 by end of the day

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PROBLEM 1: (Linearity)

  a) Check if the $f(x) = \log_2(\cosh x + \sinh x)^3$ is a linear function.

  b) Examine if the composition of two linear maps is linear.

PROBLEM 2:

Solve problem 1.4.16 and 1.4.18(c) from Moon and Stirling Book.

Note: Problem 1.4.16 will not be graded.

PROBLEM 3:

Obtain the steady state output and the state representation for system with input $x(n) = (\frac{1}{2})^n u(n)$ and transfer function

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - 0.75z^{-1} + 0.125z^{-2}}.$$

PROBLEM 4: (System Modes)

Calculate the number of system modes with output response of the system $y(n) = \left\{ 1, \frac{3}{4}, \frac{1}{2}, \frac{5}{16}, \ldots \right\}$.