EECS20n, Quiz 3
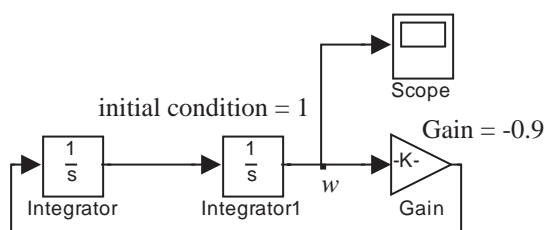
The quiz will take 15 minutes. Write your reponse on the sheet. Note that there are three problems on this exam. Please print your name and lab time here:

Last Name _____ First _____ Lab time _____

1. For the Simulink diagram shown below, write a differential equation (with no integrals, just derivatives) that describes the signal w.

2. The Simulink diagram in the previous problem can be described as a first-order differential in the following form:
$$\forall\, t \in Reals_+, \quad \dot{z}(t) = Az(t).$$

Give a definition of z in terms of w and give A.

3. For the following hybrid system, assume the input is given by

$$\forall\, t \in Reals, \quad u(t) = \begin{cases} a & \text{if } t = 1 \\ b & \text{if } t = 2 \\ absent & \text{otherwise} \end{cases}$$

Sketch the output over the range $t \in [0, 3]$.

$$B = \{(u(t), s(t)) \mid u(t) = b\}$$
$$A = \{(u(t), s(t)) \mid u(t) = a\}$$
$$C = \{(u(t), s(t)) \mid u(t) = absent \text{ and } s(t) = 0\}$$

hybridSystem

$u(t) \in \{a, b, absent\}$

B / *absent*
$s(t) := 2$

B / *absent*
$s(t) := s(t) + 2$

A / *absent*
$s(t) := 1$

$y(t) \in Reals$
$\cup \{absent\}$

S1

S2

$s(0) := 0$

C

A / *absent*
$s(t) := s(t) + 1$

$\dot{s}(t) = 1$
$y(t) = -s(t)$

$\dot{s}(t) = -1$
$y(t) = s(t)$