## Homework 2: due 01/26/18 EE 324: Signals and Systems II

## 1 Continuous time systems

Which of the following systems are dynamical? Stable? Causal? Time-invariant? Linear?

1. y(t) = 5x(t)2.  $y(t) = x(t)^4$ 3.  $y(t) = x(t-1)^2$ 4.  $\frac{dy}{dt} = x(t)$ 5.  $\frac{dy}{dt} = y(t) + x(t)$ 6.  $\frac{dy}{dt} = -y(t) + x(t)^2$ 7.  $\frac{dy}{dt} = -y(t) + x(t+4)$ 8.  $\frac{dy}{dt} = tx(t)$ 

## 2 Discrete time systems

Which of the following systems are dynamical? Stable? Causal? Time-invariant? Linear?

1. y[k] = 2x[k]2.  $y[k] = x[k+1]^2$ 3. y[k] - y[k-1] = x[k]4. y[k] - y[k-1] = x[k] - x[k-1]5.  $y[k] - y[k-1] = x[k+1]^3$ 6. y[k] = ky[k-1] + x[k]7. y[k+1] - y[k] = x[k+1] + x[k-1]8.  $y[k] - y[k-1] = x[k]/k^2$ 

## 3 System modeling

Derive the differential equations associated with the following systems

1. Input  $x = v_{in}$ , output  $y = v_{out}$ 



2. Input x = V, output  $y = i_a$ 

