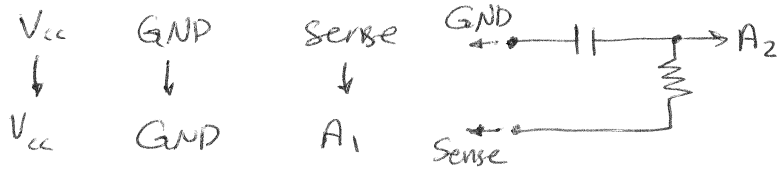
P1. $5\dddot{y}(t) = u(t) + 5\dot{u}(t) - 10y(t) - 2\ddot{y}(t)$

$\Rightarrow \dddot{y}(t) + \frac{2}{5}\ddot{y}(t) + 2y(t) = \dot{u}(t) + \frac{1}{5}u(t)$

P2.
```
A(3,5)
A(3,:)
A(:,5)
A(3:6,5:8)
A(3:6,5:end)
find(x>10)
x(find(x>10))
```

```
function y = SumSquares(x)
    y = sum(x.^2); % Simplest way to write it.
end
```

P3.



P4. $\dot{y}(t) + \alpha y(t) = u(t)$

$\Rightarrow \frac{y_k - y_{k-1}}{\Delta t} + \alpha y_k = u_k \Rightarrow y_k - y_{k-1} + \alpha\Delta t\, y_k = \Delta t\, u_k$

$\Rightarrow y_k(1+\alpha\Delta t) = y_{k-1} + \Delta t\, u_k \Rightarrow y_k = \frac{1}{1+\alpha\Delta t} y_{k-1} + \frac{\Delta t}{1+\alpha\Delta t} u_k$

P4. $L\frac{di}{dt} + Ri + \frac{1}{C}\int i\,dt = v$

$\begin{cases} x_1 = i \\ x_2 = \int i\,dt \end{cases} \Rightarrow \begin{cases} \dot{x}_1 = \frac{di}{dt} = \frac{1}{L}\left(-Ri - \frac{1}{C}\int i\,dt + v\right) = -\frac{R}{L}x_1 - \frac{1}{CL}x_2 + \frac{1}{L}v \\ \dot{x}_2 = i = x_1 \end{cases}$

$\Rightarrow \dot{\underline{x}} = \begin{bmatrix} -\frac{R}{L} & -\frac{1}{CL} \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} \frac{1}{L} \\ 0 \end{bmatrix} u$

$y = \begin{bmatrix} 1 & 0 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$v = i\dot{x}_1 - Rx_1 + \frac{1}{C}x_2 \Rightarrow y = \begin{bmatrix} -R & -\frac{1}{C} \end{bmatrix}x + [1]u$

Sol. is not unique
e.g. $x_1 = \int i\,dt$, $x_2 = i$