PINNS w/ Polynomial Reg.

$y'' = -1 \rightarrow y = -x^2/2 + c_1 x + c_2$

$\forall\ y(0) = 0$
$y(1) = 0$ $\Rightarrow$ $\boxed{y_{analy} = 0.5(1-x^2)}$

OKAY, Now lets try to apply PINN like method w/ model

$M(x, w) = w_3 + w_2 x + w_1 x^2$ $\Rightarrow$ Expressive enough for our model eqn.

- Loss "least squares";

Nok $M''(w) = 2w_1$ & $\mathcal{L}_{tobl} = \mathcal{L}_{bound} + \mathcal{L}_{domain}$ & take e-point in domain...

~~$\mathcal{L}_{tobl} := (2w_1+1)^2 + (w_3 + w_2 x)$~~

$$\mathcal{L}_{tobl} := \underbrace{(2w_1+1)^2}_{\text{domain}} + \underbrace{(w_3 - w_2 + w_1)^2 + (w_3 + w_2 + w_1)^2}_{\text{Bound}}$$

$\operatorname{argmin}_{w_1, w_2, w_3} \mathcal{L}_{tobl}$ $\Rightarrow$ $w_1 = -1/2,\ w_2 = 0,\ w_3 = 1/2$

$\Rightarrow$ Thus, $y_{PINN} := 0.5(1-x^2)$

? But is it enough to have a function that is twice diff. for y'' of any type?

? What happens if you have more complex M?

↳ apparently the minimizer of your ~~func~~ loss does not satisfy the point constraint in the middle...

↳ you need regularization of large amounts to get reasonable solutions...