50+1

Method of Lines

$$\begin{cases} \dfrac{\partial u}{\partial t} = \varepsilon \dfrac{\partial^2 u}{\partial x^2} - u\dfrac{\partial u}{\partial x} & 0 < x < 1 \\ u(0,t) = u_{exact}(0,t) \\ u(1,t) = u_{exact}(1,t) \end{cases}$$

$$u(x,0) = u_{exact}(x,0)$$

- Why MOL ?
- How to implement MOL ?
- Matlab ode 15s

  [t, y] = ode15s(odefun, tspan, y0)

  f = odefun(t, y, parameters)

<u>Example</u> The van der Pol equations

$$\begin{cases} y_1' = y_2 \\ y_2' = 1000(1-y_1^2)y_2 - y_1 \end{cases}$$

$y_1(0) = 2$, $y_2(0) = 0$

$t: 0 \rightarrow 3000$

50+2

```
function f = vdp1000(t,y)
    f = [y(2); 1000*(1-y(1)^2)*y(2)-y(1)];
```

call: `[t,y] = ode15s(@vdp1000, [0,3000], [2;0]);`

$$\begin{bmatrix} t_0 & y_1^0 & y_2^0 \\ t_1 & y_1^1 & y_2^1 \\ \vdots & \vdots & \vdots \\ t_N & y_1^N & y_2^N \end{bmatrix}$$

- ode15s for Burgers' equation

$\boxed{\text{HW \#6}}$