

1

$$u(0 + \tau) = u(0) + \tau u'(0) + \frac{\tau^2}{2!} u''(0) + O(\tau^3)$$

$$u''(t) + \omega^2 u(t) = 0 \Rightarrow u''(0) + \omega^2 u(0) = 0 \Rightarrow u''(0) = -\omega^2 u(0)$$

$$u'(0) = 0$$

$$u(0 + \tau) = u(0) - \frac{\tau^2}{2!} \omega^2 u(0)$$

2

$$\frac{y^1 - y^{-1}}{2\tau} = V \Rightarrow y^{-1} = y^1 - 2V\tau$$

$$y^{n+1} = 2y^n - \tau^2 \omega^2 y^n - y^{n-1}$$

$$n = 0 \Rightarrow y^1 = 2y^0 - \tau^2 \omega^2 y^0 - y^{-1} \Rightarrow 2y^1 = U(2 - \tau^2 \omega^2) + 2V\tau$$

3

$$u(0 + \tau) = u(0) + \tau u'(0) + \frac{\tau^2}{2!} u''(0) + O(\tau^3)$$

$$y^1 = U + \tau V - \frac{\tau^2 \omega^2}{2!} U + O(\tau^3)$$