$$\frac{dv}{dt} = \frac{\cos t}{\sin v}, \quad v(0) = 1$$

$$\sin v \, dv = \cos t \, dt$$

$$-\cos v = \sin t + C$$

$$-\cos 1 = \sin 0 + C$$

$$C = -\cos 1$$

$$\therefore \; -\cos v = \sin t - \cos(1)$$

$$m\ddot{x} + c\dot{x} + kx = F$$

$$mx^2 + cx + k = 0$$

$$x = \frac{-c \pm \sqrt{c^2 - 4mk}}{2m}$$

stable

when $c^2 - mk = 0$, repeated

$$F = C_1(e^{-\lambda t}) + C_2 t(e^{-\lambda t})$$

$c^2 - mk < 0$ complex

stable

$$F = C_1 e^{-\frac{c}{2m}t}(C_1 \sin wt + C_2 \cos wt)$$

$c^2 - mk > 0$ real

$$F = C_1 e^{\lambda_1 t} + C_2 e^{\lambda_2 t}$$

$y' + e^x y = q(x)$

$\sigma y' + \sigma e^x y = \sigma q(x)$

$d\{\sigma y\} = \sigma y' + y\sigma'$

$\therefore \sigma' - \sigma e^x = 0$

$\therefore \sigma' = \sigma e^x$

$\frac{d\sigma}{\sigma} = e^x dx$

$1.\ ' = e^x$

$\sigma = e^{e^x}$

$$\frac{d(\sigma y)}{dx} = 1$$

$e^{e^x} y = x + c$

$y = \frac{x+c}{e^{e^x}}$

$1 = \frac{c}{e}$ $\quad c = e \quad \therefore y = \frac{x+e}{e^{e^x}}$

$\ddot{y} + 4y = \cos 2t$

$\lambda^2 + 4 = 0$ $\quad \therefore y_h = c_1 \sin 2t + c_2 \cos 2t$

$\lambda = \pm 2i$ $\quad y_p = At\sin 2t + Bt\cos 2t$

$y_p' =$