Autonomous / Non-autonomous

↓ ↓

$\frac{dy}{dt} = f(y)$ $y'' = ty$ ✓

$y' = y$ ✓ $ty = 2$

$y' = 2y$ ✓

$y'' = y - 2 + y'$ ✓

$y'' = ty$ X

Homogenous vs Non-homogenous

1) Put in S.F.

2) RHS = 0

3) Homogenous

Ex.

$$y' + P(x)y + H(x) = 0$$

Non-homogenous
≠
$7x$

Whiteboard

2.3

1) $\frac{dP}{dt} = rP$

Find the rate constant r if the population doubles in 12 days.

Suppose $p(0) = p_0$

$$p(12) = 2p_0.$$

$$\frac{dp}{dt} = rp$$

$$\frac{dp}{p} = r\,dt$$

$$\int \frac{1}{p}\,dp = rt + C$$

$$\ln|P| = rt + C$$

$$|P| = e^{rt+C}$$

$$P = e^{rt+C}$$

$$P = e^{rt} e^{C}$$

$$P = Ce^{rt}$$

$$2P_0 = P_0 e^{12r}$$

Solve for r

$$2 = e^{12r}$$

$$\ln(2) = \ln e^{12r}$$

$$\ln(2) = 12r$$

$$r = \frac{\ln(2)}{12}$$