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ELL707

[Limit cycles exist in dimensions $n \geq 2$]

Examples of Biomolecular Oscillators

- may be given via a model (differential equation)
- can do experiment / look at data

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videos of Biomolecular Oscillator

→ repressilator (original, modified)

→ spatiotemporal oscillations

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aim : how to use mathematical models to understand / design biomolecular oscillators ?

#1

Consider the van der Pol oscillator

$$\ddot{x} - b(1-x^2)\dot{x} + x = 0.$$

a) Using $\dot{x} = y$, write down above second order differential equation as two first order differential equations.

b) Using $r^2 = x^2 + y^2$ and $\theta = \tan^{-1}\left(\frac{y}{x}\right)$, write equations in a) in polar co-ordinates,

$\dot{r} =$ _____?

$\dot{\theta} =$ _____?