Quiz 8: 15 March Name: Key Section:

The differential equation system is expressed in polar coordinates:

$$\frac{dr}{dt} = \sin(3\pi r) \quad \& \quad \frac{d\theta}{dt} = 1$$

(3pts) (a) Find all the periodic solutions orbits.

Periodic solutions $r = \frac{n}{3}$ for any non-negative integer n

$\theta = t + C$

(3pts) (b) Which orbits are attracting?

$\frac{\partial}{\partial r} \sin 3\pi r = 3\pi \cos 3\pi r < 0$ for $r = \frac{n}{3}$ $\cos(\pi n) < 0$

$\Rightarrow$ n odd

The circles radii $\frac{2k+1}{3}$ for integer $k \geq 0$ are attracting.

(3pts) (c) Which orbits are repelling? $\cos(\pi n) > 0 \Rightarrow n$ even

$\frac{\partial}{\partial r} \sin 3\pi r = 3\pi \cos 3\pi r > 0$

The circles radii $\frac{2k}{3}$ for integer $k \geq 0$ are repelling.