6.3 Summary Quiz Part III: What Happens in the Original System for the Pendulum?

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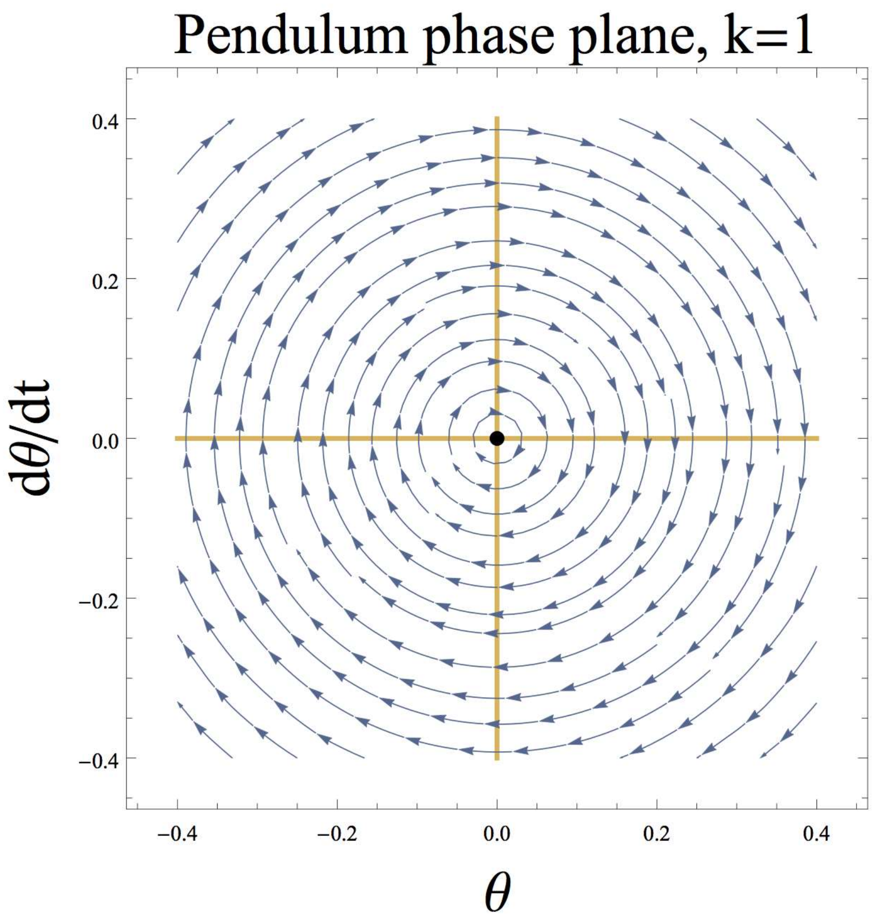
Given that we can find exact solutions of the differential equation

$$\frac{d^2\theta}{dt^2} = -k\theta$$

we might wonder whether phase plane analysis is helpful. One nice feature of the phase plane is that it allows us to see how the position and velocity of the pendulum influence each other.



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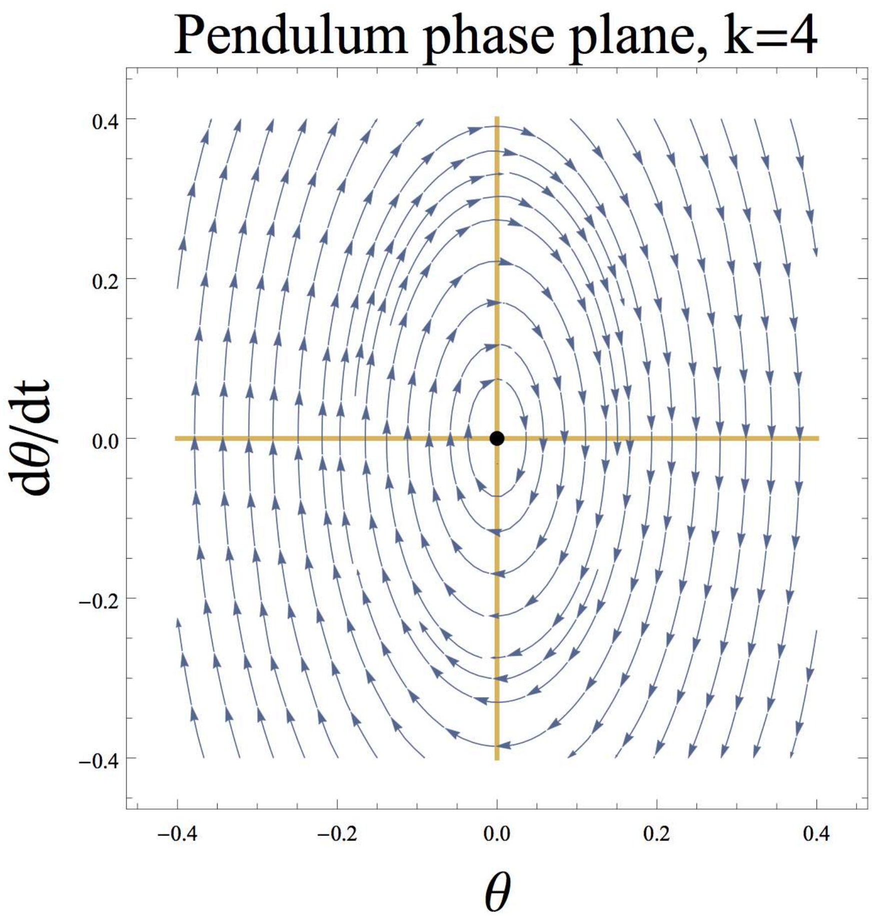

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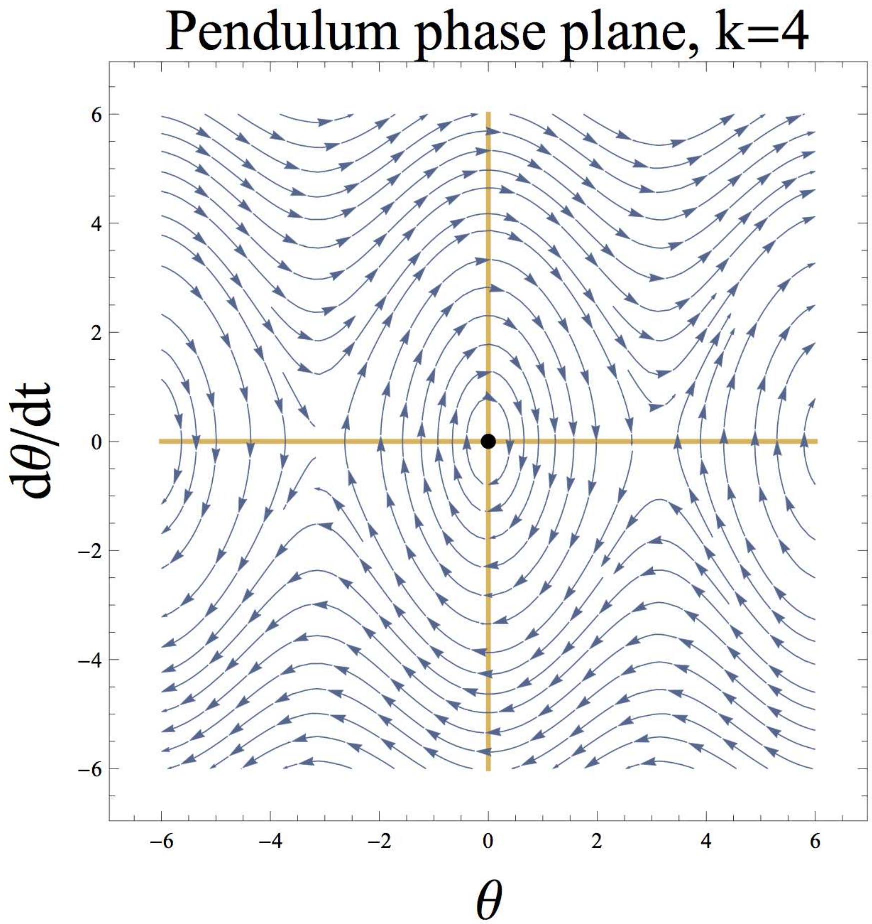
It is also useful to contrast this phase plane with the phase plane for the original system

$$\frac{d^2\theta}{dt^2} = -k\sin(\theta).$$

Here phase plane analysis is very useful as we can't find exact solutions. Here is the phase plane for $k =$ with trajectories shown.



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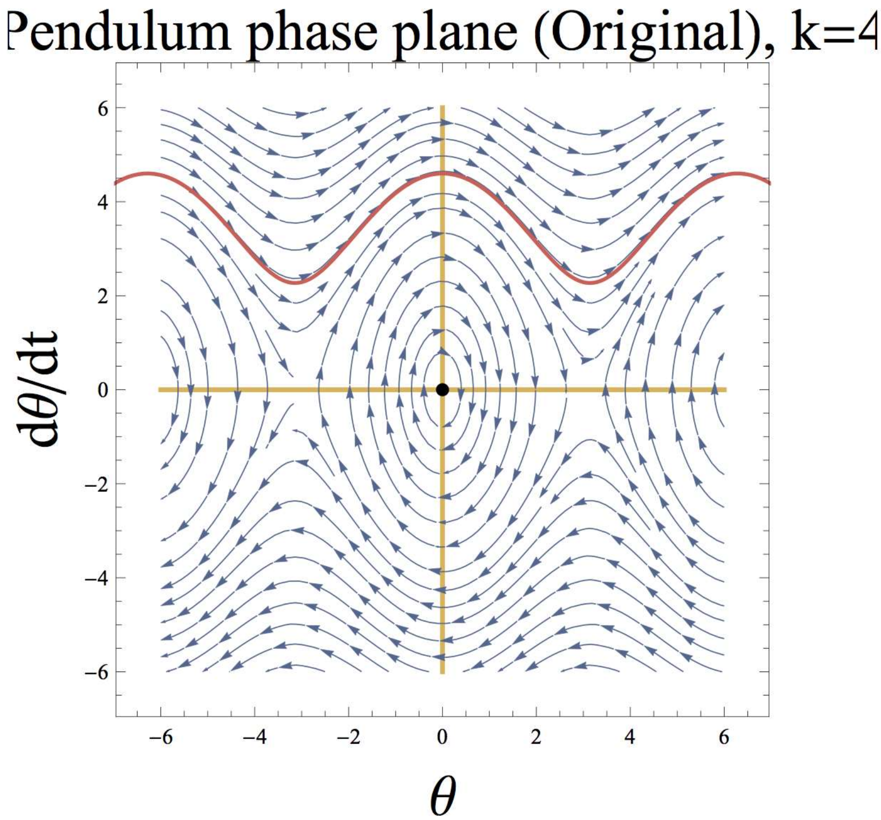
Question 1: Think About It...

1/1 point (graded)
What is the physical interpretation of the highlighted trajectory?



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Changes from one equilibrium state to another.
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Thank you for your response.

Explanation
In this case, we see the trajectory is not a closed loop but an oscillating curve oriented to the right. The angular velocity is always positive, meaning the angle is always increasing, from 0 to π to 2π and so on. Physically, this means the pendulum had initial velocity great enough that it could swing over the top of the pivot point and because there is no friction, it will continue to rotate completely around the pivot indefinitely. For more, see the Examples at https://en.wikipedia.org/wiki/Pendulum_(mathematics) which show an animated pendulum.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

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