ASEN 6060
ADVANCED ASTRODYNAMICS
Week 4 Discussions

Question 1

Question 1: Under what conditions is a trajectory that is periodic in the rotating frame also periodic in the inertial frame?

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Group Brainstorming:

- When the period of the P1-P2 orbit is in a resonance with the period of the spacecraft

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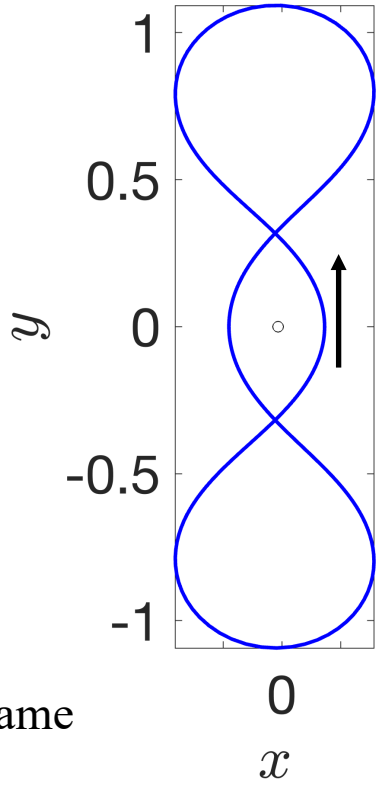
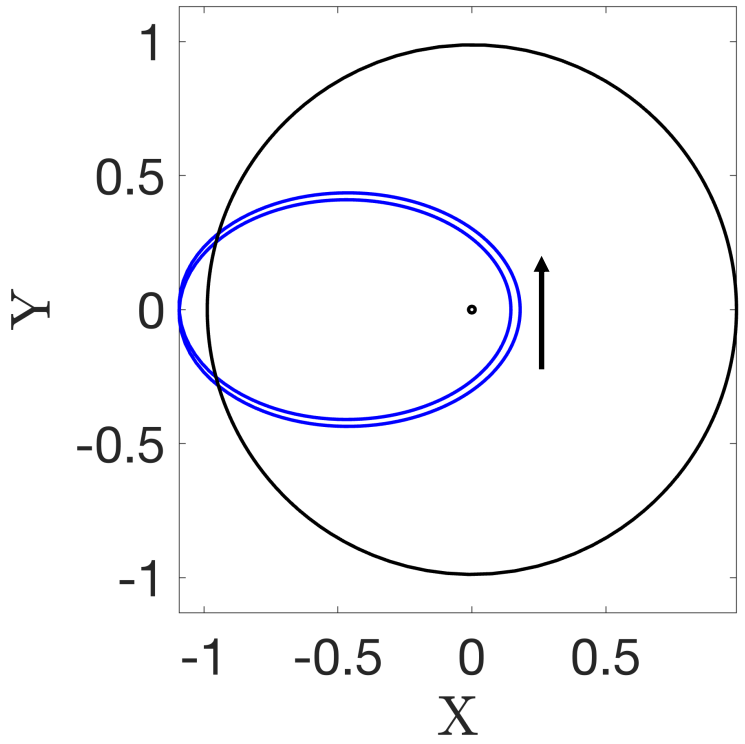
2:1 resonant orbit family, PO has T = 2pi, propagate for T



Rotating frame



Inertial frame

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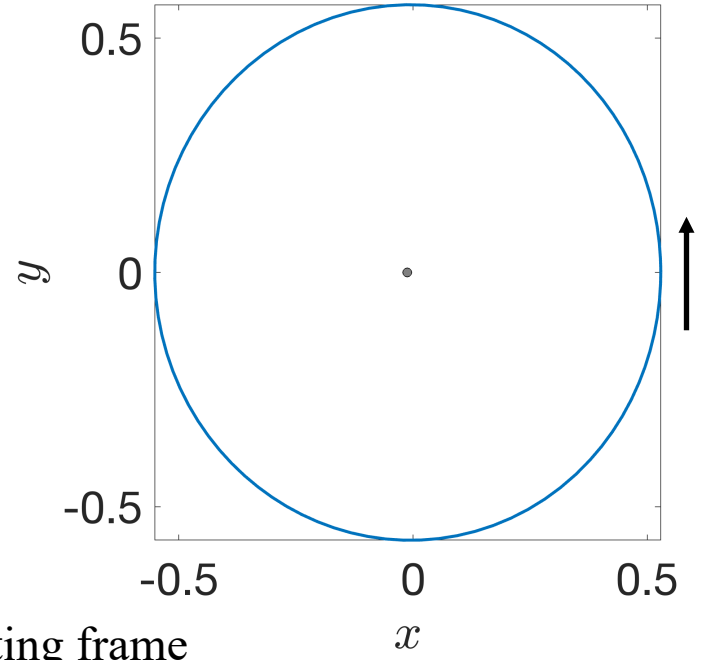
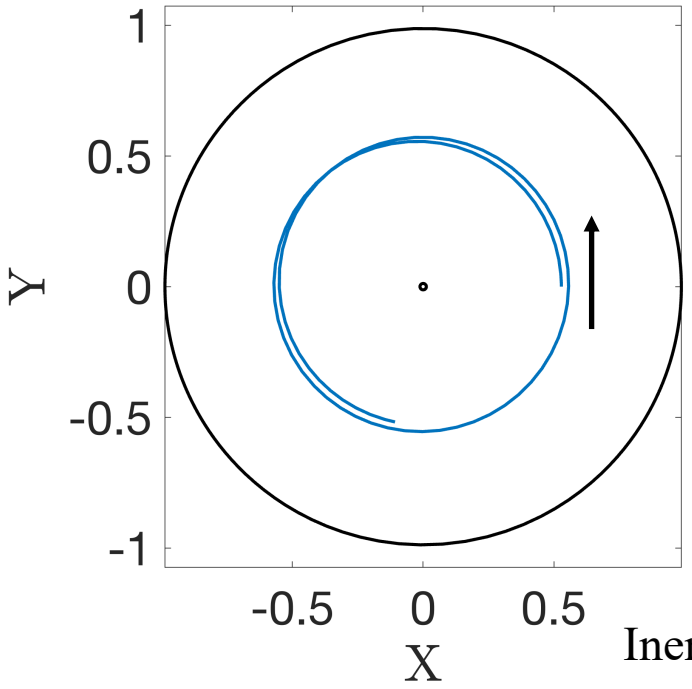
2:1 resonant orbit family, PO has T = 4.507
Not in resonance: T/(2pi) = 0.717, propagate for T



Rotating frame



Inertial frame

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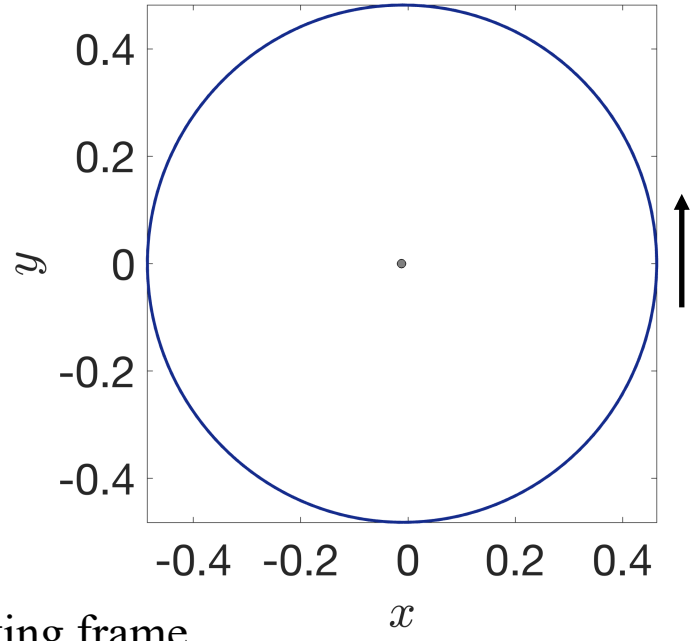
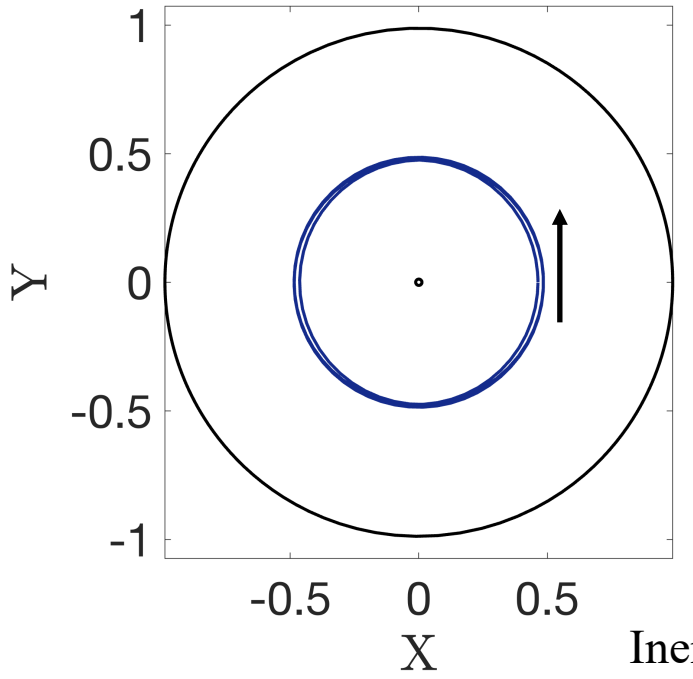
Question 1: Under what conditions is a trajectory that is periodic in the rotating frame also periodic in the inertial frame?

2:1 resonant orbit family, T = pi
T/(2pi) = 0.5, Propagate for 2T



Rotating frame



Inertial frame

Question 2

Question 2: Consider states that produce a) prograde and b) retrograde motion relative to P_1 in the rotating frame. What could their direction of motion possibly be (relative to P_1) in the inertial frame? (prograde, retrograde, or either)?

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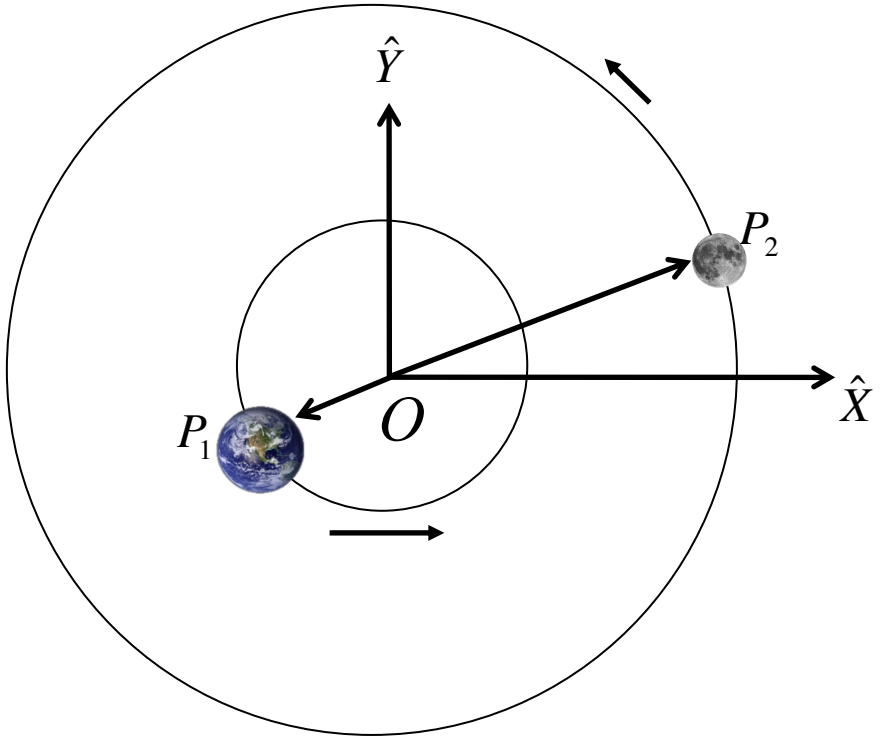
Group Brainstorming:

Retrograde state wrt P1

- Could either have motion prograde or retrograde in the inertial frame

Prograde state wrt P1

- Moving prograde in the inertial frame as well



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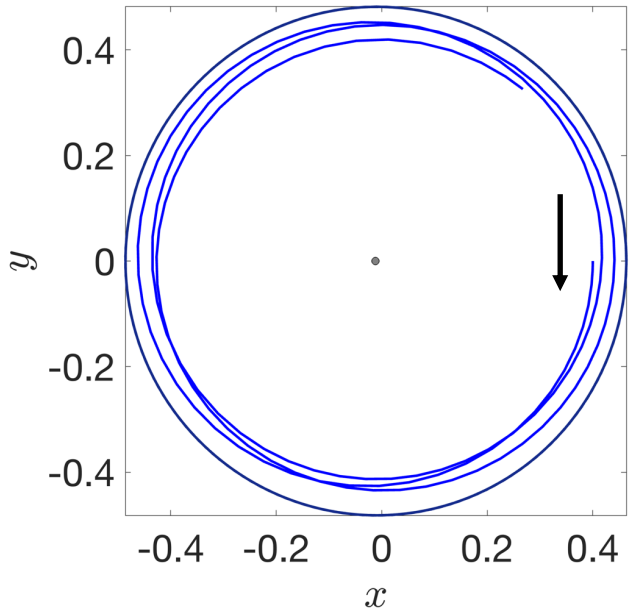
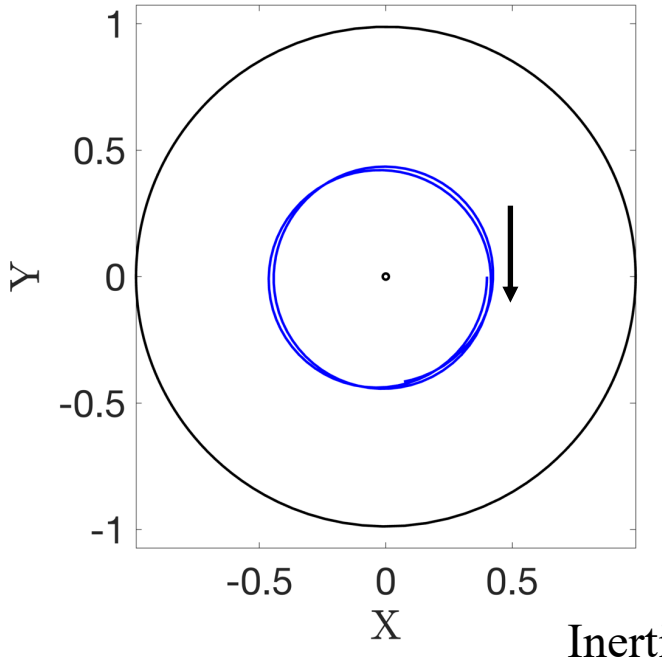
This orbit is retrograde in the rotating and inertial frames



Rotating frame



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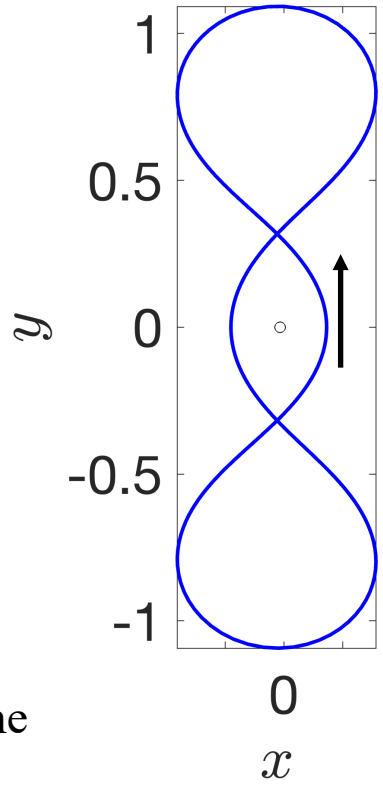
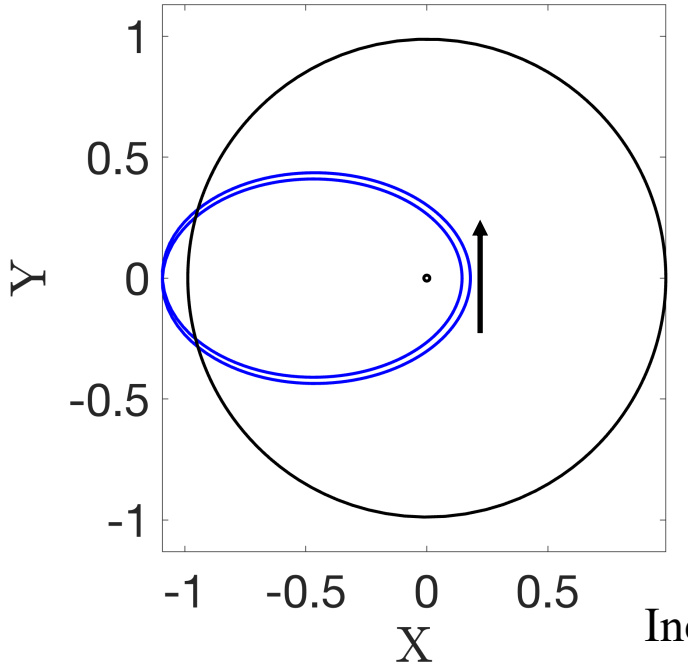
This orbit has prograde & retrograde segments in rotating frame; prograde in inertial frame



Rotating frame

2:1 resonant orbit family, PO has T = 2pi



Inertial frame

Question 3

Question 3: You and your colleague are each numerically generating a trajectory associated with the same initial state $[x_0, y_0, 0, \dot{x}_0, \dot{y}_0, 0]^T$ and integration time. You are each using your own code or using off-the-shelf software. Do you expect to recover the exact same state as your colleague after the integration time? Why/why not?

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Group Brainstorming: