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## Script for 2011 ME227 HW 4 Problem 1

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### 1(a) Linear bike model

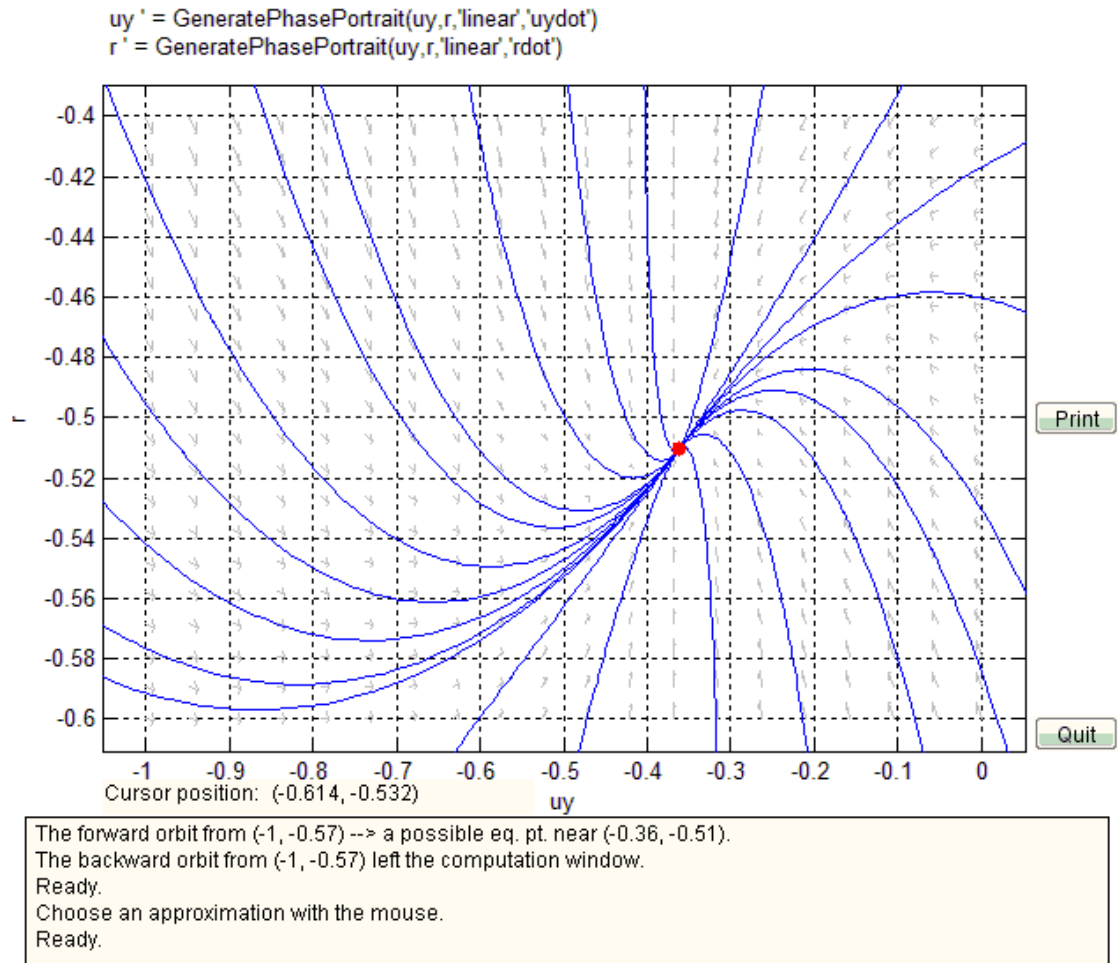
We expect to see one equilibrium for the linear model. See the understeer gradient below. Since it is positive, we expect an understeering car.

$K =$

$0.0361$

### 1(b) Phase portrait: linear bike model

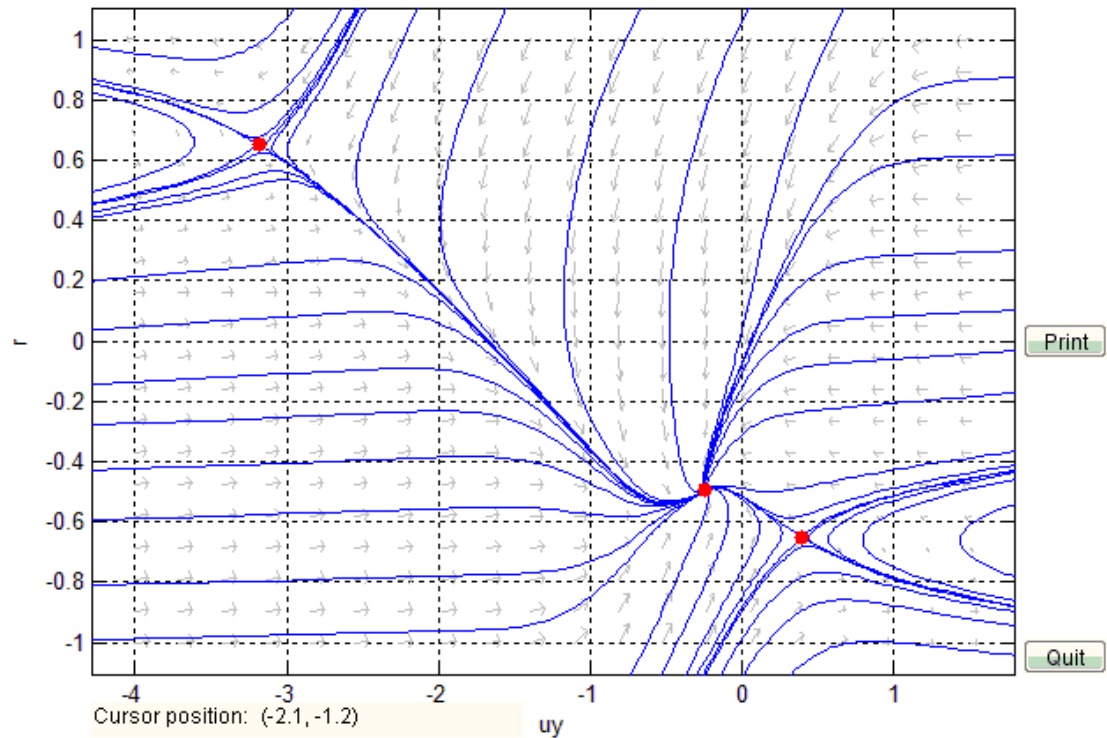
We find one equilibrium: a stable node at ( $U_y = -0.3617$ ,  $r = -0.5104$ ).



## 1(c) Phase portrait: nonlinear bike model

We find three equilibria: (1) stable focus at ( $U_y = -0.2425$ ,  $r = -0.4942$ ). (2) unstable saddlepoint at ( $U_y = -3.1853$ ,  $r = 0.6499$ ) (3) unstable saddlepoint at ( $U_y = 0.3928$ ,  $r = -0.6499$ ) All of our equilibria have complex eigenvalues. We still have one stable equilibrium, a node in the linear case (with negative eigenvalues), and a focus in the nonlinear case (with LHP complex eigenvalues).

```
uy' = GeneratePhasePortrait(uy,r,'nonlinear','uydot')
r' = GeneratePhasePortrait(uy,r,'nonlinear','rdot')
```



Ready.  
Choose an approximation with the mouse.  
Ready.  
Choose an approximation with the mouse.  
Ready.

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