Diagonalization (Part Z)

AE353 Spring ZOZ3 Bretl

LAST TIME

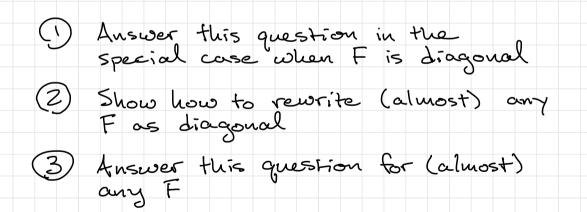
- x = Ax+Bu
 model of all dynamics we cave about u = -Kx
 model of all controllers we care about
- x = (A-BK)× ← closed-loop system
- X(t) = e X(o) = solution (by matrix exponential)

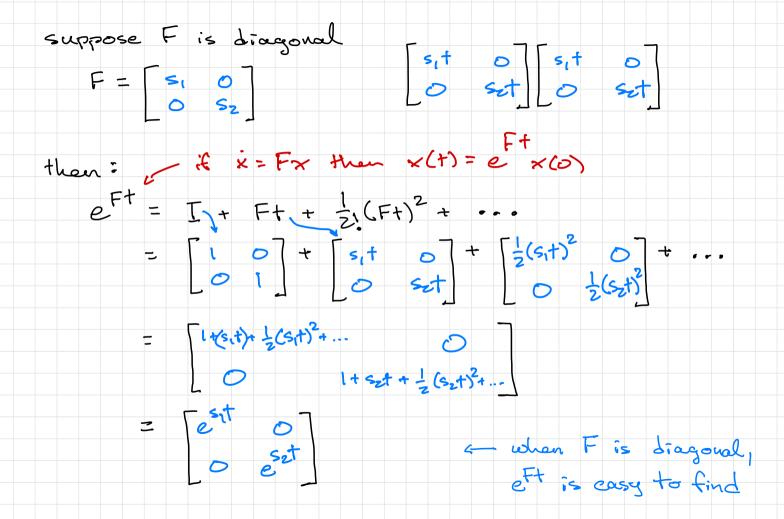
X(t) -> O as t-> => if and only if all eigenvalues of } asymptotic stability A-BK have negative real part

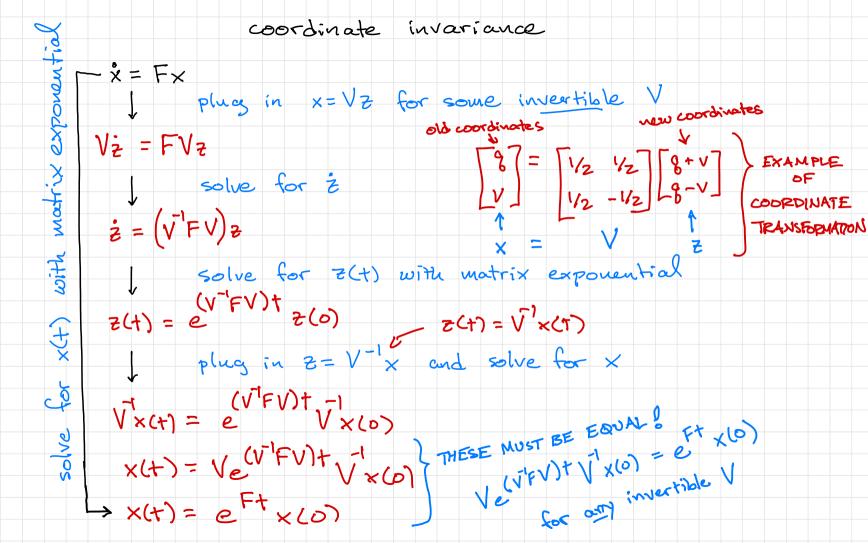
OUR GOAL IS TO PROVE THIS

x=Fx < for which F does x(t) > D as t > 00???

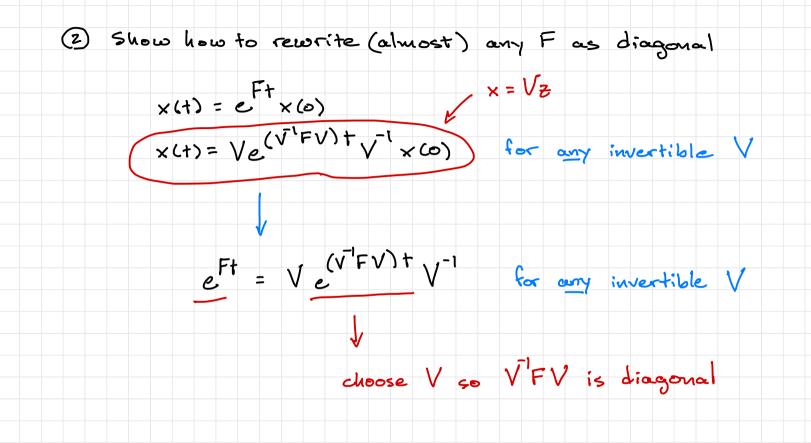
STRATEGY



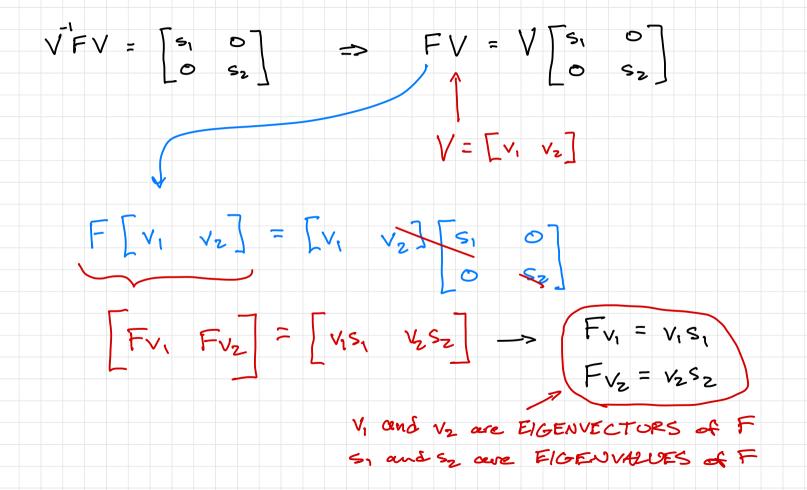


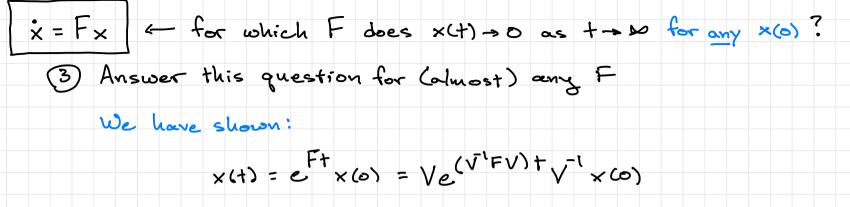


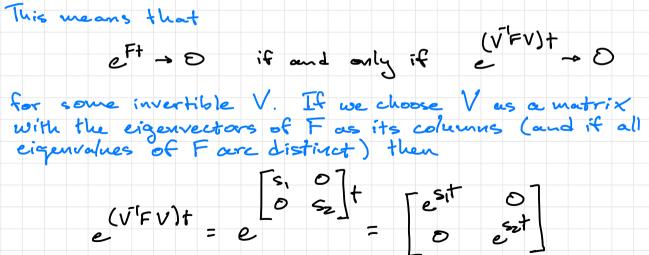
 $\dot{x} = Fx$ (- for which F does $x(t) \rightarrow 0$ as $t \rightarrow w$ for any x(0)? x(t) = (Ft) + (0) $x(t) = Ft \rightarrow 0$ as $t \rightarrow w$ () Answer this question in the special case when F is diagonal $F = \begin{bmatrix} s_1 & 0 \end{bmatrix} \Rightarrow e^{s_1} \begin{bmatrix} e^{s_1} & 0 \end{bmatrix} \begin{bmatrix} s_2 \\ 0 \end{bmatrix} \begin{bmatrix} s_2 \end{bmatrix}$ 5, = ce + jb $s_{1} = a + jb$ $s_{1} = a + jb$ $s_{1} = (a + jb) + at jb + at (a + jb) + at jb + at (a + jb) + jsin(b + jb)$ e = e = e = e = e = e = e (cos(b + jsin(b + jb)))



choose V so VIFV is diagonal







where 5, and 52 are the eigenvalues of F (for our Zx2 example).



is asymptotically stable if and

only if all eigenvalues of F have

regative real part.