$$\dot{X} = A(t)X$$

$A(t)$ is not periodic

$A(t)$ is periodic

By using theorem 6.6

$\lambda_1 + \lambda_2 > 0 \Rightarrow x = 0$ *is unstable*

$\lambda_1 + \lambda_2 < 0 \Rightarrow x = 0$ *may be stable or unstable*

$\dot{X} = BX + f(t, X)$

$\dot{X} = BX + C(t) + f(t,X)$

applying theorems 6.3,6.4

if

* $\mathrm{Re}(\lambda_k) < 0$ $(\mathrm{Re}(\lambda_k) > 0)$

* $\lim_{t\to\infty} \|C(t)\| = 0$

then $x = 0$ *is asymptotically stable* (*unstable*)

Applying theorems 7.1,7.3

if

* $\mathrm{Re}(\lambda_k) < 0$ ($\mathrm{Re}(\lambda_k) > 0$)

* $\lim_{t\to\infty} \|C(t)\| = 0$

*f *is lipish in* x *and*

$$\lim_{t\to\infty} \frac{\|f(t,x)\|}{\|x\|} = 0$$

then $x = 0$ *is asymptotically stable* (*unstable*)

$$\dot{X} = AX$$

$\mathrm{Re}(\lambda_k) < 0 \Rightarrow$

$x = 0$ *is*

asymptotically stable

$\mathrm{Re}(\lambda_k) \leq 0 \Rightarrow$

$x = 0$ *is*

lyapunov stable

$\mathrm{Re}(\lambda_k) > 0 \Rightarrow$

$x = 0$ *is*

unstable

$$\dot{X} = f(x)$$

$$\dot{X} = AX + g(x)$$

Applying theorems 7.1,7.3

if

$* \ \mathrm{Re}(\lambda_k) < 0 \ (\mathrm{Re}(\lambda_k) >$

$* \ g \ \ is \, lipish \ in \ \ x \ and$

$$\lim_{t \to \infty} \frac{\|g(x)\|}{\|x\|} = 0$$

$then \ x = 0 \ is$

$asymptotically \ stable$

$(unstable)$

First integral

morse lemma