

1)

$$s = \sigma + j\omega$$

$$z = \rho + j\nu = e^{\sigma T} \cdot e^{j\omega T}$$

$$z_M = e^{\sigma T} \quad \psi = \omega T$$

$$|e^{j\omega T}| = 1$$

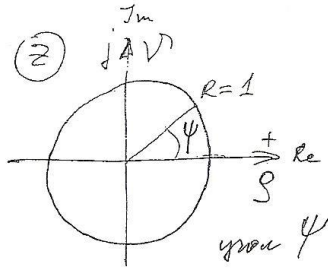
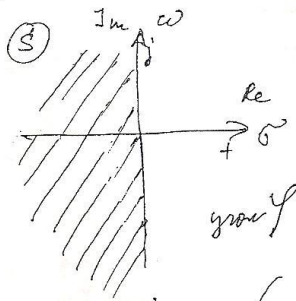
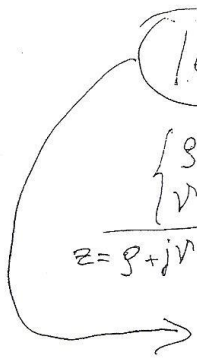
$$\begin{cases} \rho = e^{\sigma T} \cos \omega T \\ \nu = e^{\sigma T} \sin \omega T \end{cases}$$

$$z = \rho + j\nu = e^{\sigma T} (\cos \omega T + j \sin \omega T) = e^{\sigma T} \cdot e^{j\omega T}$$

$$|z| = \sqrt{\rho^2 + \nu^2} = e^{\sigma T}$$

$$\sigma = \frac{1}{T} \ln z_M$$

$$\omega = \frac{\psi \pm 2\pi k}{T}, \quad k = 0, 1, 2, \dots$$



если $\sigma = 0$ (мнимая ось) $\Rightarrow z_M = e^0 = 1$ - единичная окружность

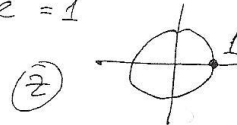
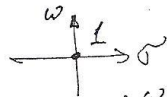
если $\sigma < 0$ (левая полуплоскость) $\Rightarrow z_M < 1$ - внутри круга

если $\sigma > 0$ (правая полуплоскость) $\Rightarrow z_M > 1$ - вне круга

Рассмотрим некоторые точки:

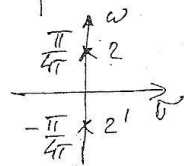
Т.1 $s(0,0)$

$$z = e^{\sigma T} \cdot e^{j\omega T} = e^0 \cdot e^0 = 1$$



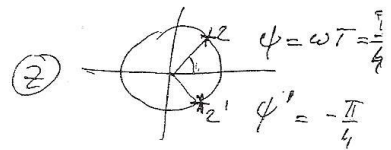
Т.2, 2'

(3)



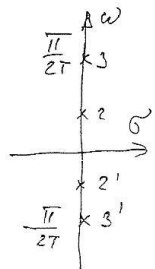
пара мнимых точек

$$\begin{aligned} \omega &= \frac{\pi}{4T} \\ \omega' &= -\frac{\pi}{4T} \end{aligned}$$

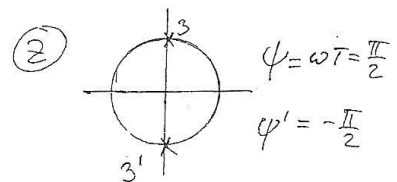


Т.3, 3'

(3)

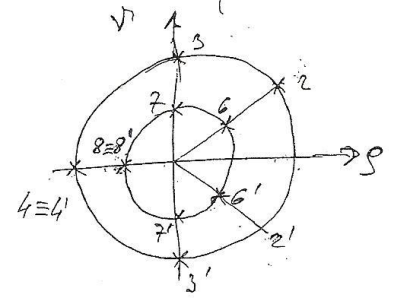
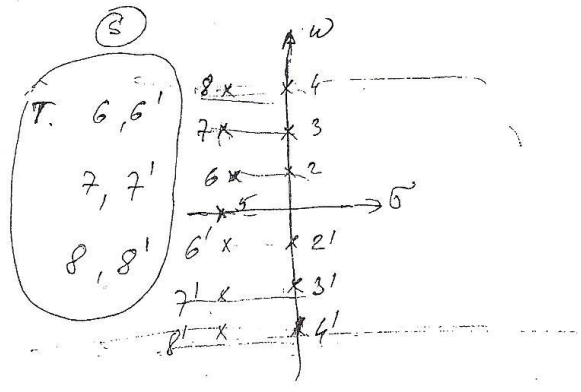
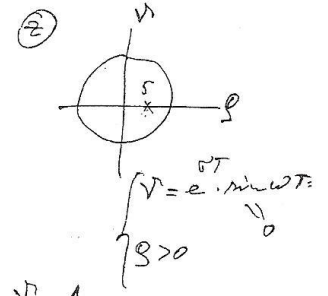
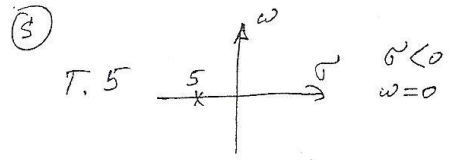
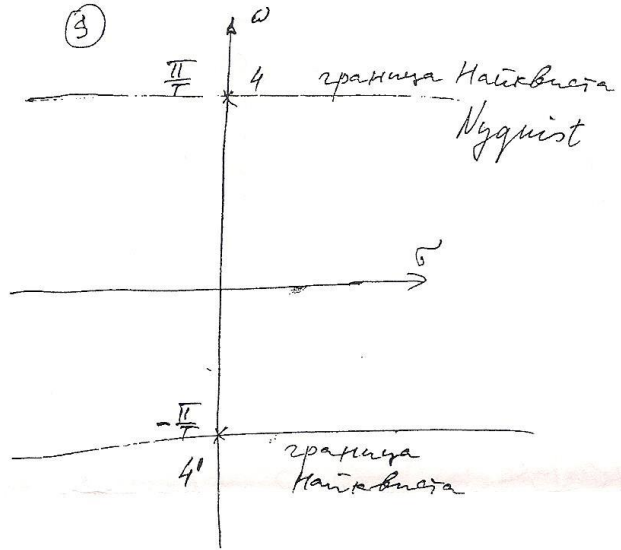
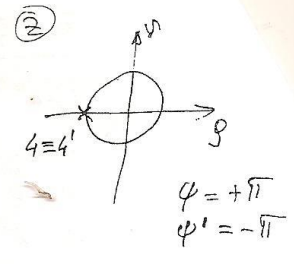
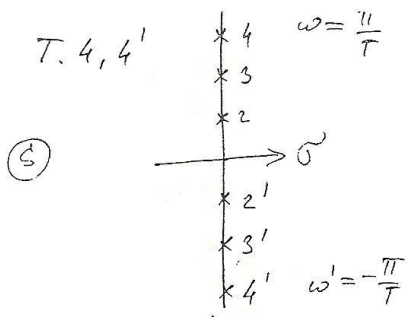


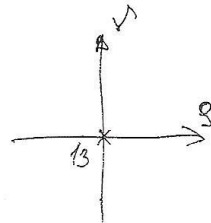
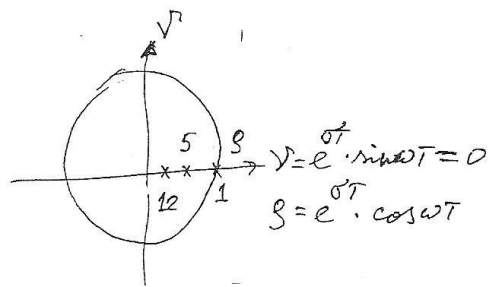
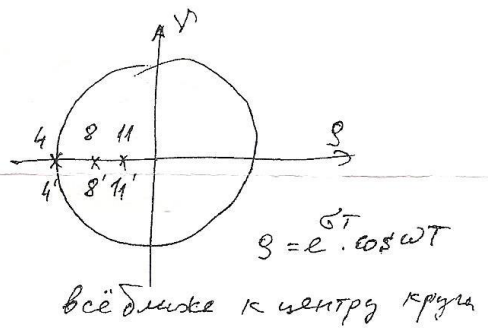
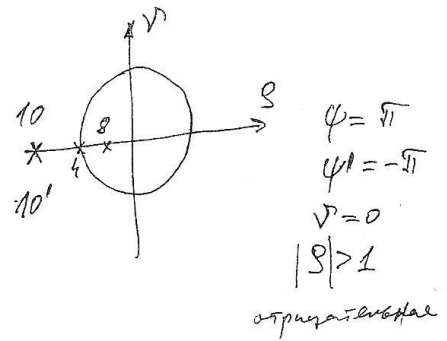
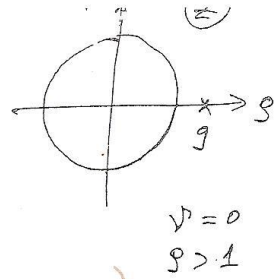
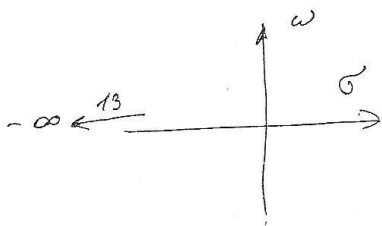
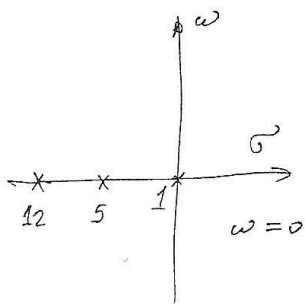
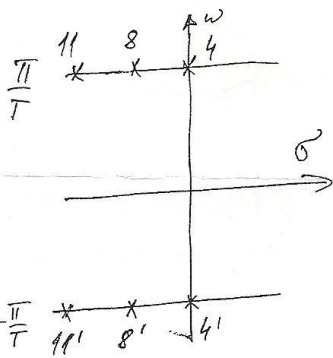
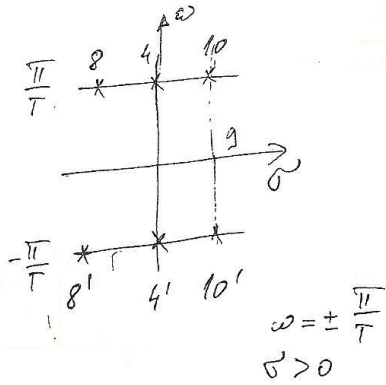
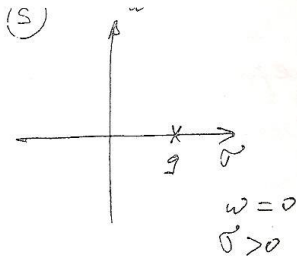
$$\begin{aligned} \omega &= \frac{\pi}{2T} \\ \omega' &= -\frac{\pi}{2T} \end{aligned}$$



Пары (3) на мнимой оси соответствуют (2) на единичной окружности

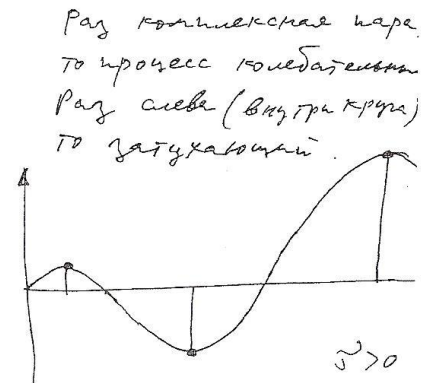
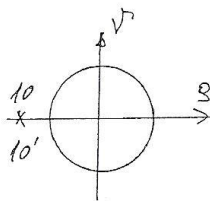
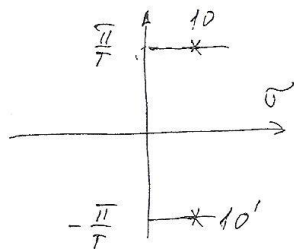
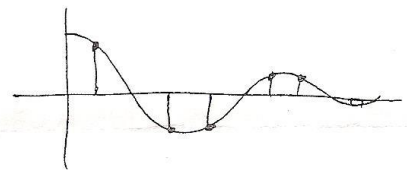
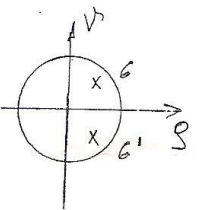
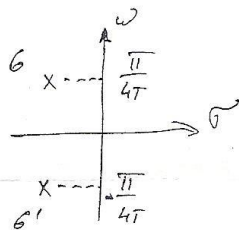
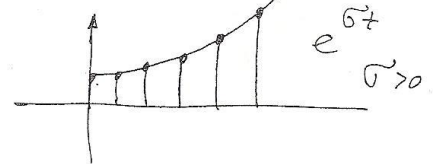
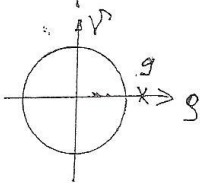
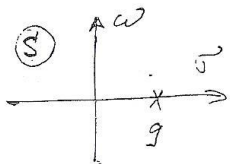
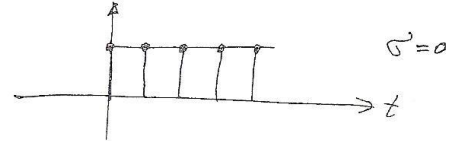
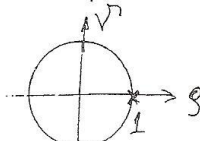
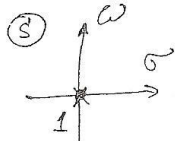
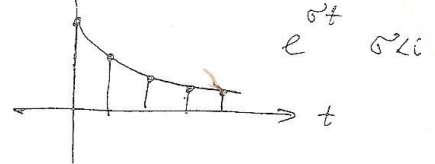
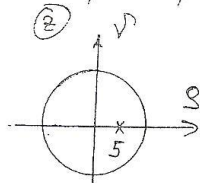
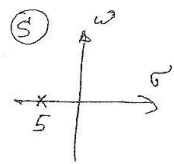
2





4)

Расположение полюсов передаточной функции отражает характер переходных процессов:



Раз комплексная пара
то процесс колебательный
Раз слева (внутри круга)
то затухающий.