Ex: plot the phaseline for $\frac{dy}{dt} = -r\left(1-\frac{y}{T}\right)\left(1-\frac{y}{K}\right)y$. $r>0,\ 0<T<K$

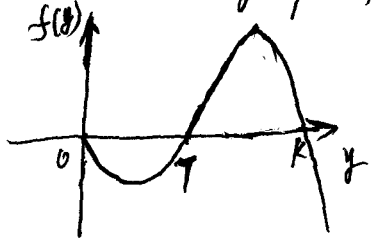
and sketch serveral graphs of solutions in the ty-plane.

step 1: $f(y)=0$. i.e. [find constant solutions, i.e. equilibrium solut.]

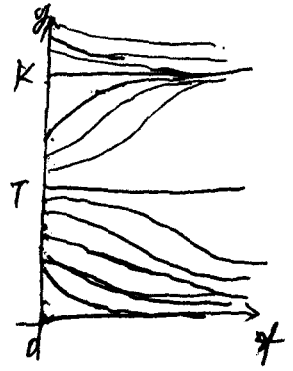
$$-r\left(1-\frac{y}{T}\right)\left(1-\frac{y}{K}\right)y = 0,$$

$y = 0,\ T,\ K$. three equilibria.

step 2. draw the graph of $f(y)$ versus y.



phase line



[* (i) As long as $y \in (0,T)$. $\frac{dy}{dt} < 0$.

Thus the solution in $(0,T)$ decreases as $t \uparrow$.

(ii) For $y \in (T,K)$. $\frac{dy}{dt} > 0$, solutions in (T,K) $\uparrow$ as $t \uparrow$.

(iii) For $y > K$, $\frac{dy}{dt} < 0$, $\downarrow$ as $t \uparrow$

(iv). As y is close to $0, T, K$, $\frac{dy}{dt}$ close to zero. Solution curves becomes relatively flat.