Logistic Model

$dX/dt = \rho(1-X(t)/K)\cdot X(t)$ - logistic model of growth.
$X(t)= K\cdot X_0\cdot \exp(\rho\cdot t)/(K+X_0\cdot \exp(\rho\cdot t)-X_0)$ analytical solution.

Modification of Logistic Model
$dX/dt = \rho(t)(1-X(t)/K(t))\cdot X(t)$ - logistic model with time dependent parameters.

$dX/dt = \rho(1-X(t)/K)\cdot X(t)-C\cdot X(t)$ - logistic model with harvesting

$dX/dt = \rho(1-X(t-\tau)/K)\cdot X(t)$ - logistic model with delay

Symbol	Importance	Value	Units	
X - population size	**main variable**	X_0=135000	ind	Var.
C - harvest coefficient	percentage of population that is consumed per year	10	%	Parameters
K - carrying capacity	Max. number of individuals that could be supplied by environment	540000	ind	
ρ - growth factor	rate of population growth	0.71	ind·years^{-1}	
τ - time delay	time delay	1/6	years	

$X_1= K\cdot X_0\cdot \exp(\rho\cdot t)/(K+X_0\cdot \exp(\rho\cdot t)-X_0) =$
$= 540000\cdot 135000\cdot \exp(0.71)/(540000+135000\cdot \exp(0.71)-135000) = 218190$

$X_{0.5K}= K\cdot X_0\cdot \exp(\rho\cdot t)/(K+X_0\cdot \exp(\rho\cdot t)-X_0) =$
$= 540000\cdot 135000\cdot \exp(0.71\cdot t)/(540000+135000\cdot \exp(0.71\cdot t)-135000) = 270000$
$t = 1.5473$