

**Math 172   Spring 11   WS11**

Consider a situation where a predator population consumes prey at a rate  $R(V) = \frac{20V}{V+50}$  per predator, so that the rate of change of the victim population is

$$\frac{dV}{dt} = 6V \left( 1 - \frac{V}{150} \right) - \frac{20V}{V+50} P$$

a. What can you say about the behavior of  $V$  if  $P = 0$ ? What equilibrium value is reached?

b. Superimpose the gain curve and the loss curve for the victim population. These are graphs that show the positive part and the negative part of the equation for  $\frac{dV}{dt}$  as functions of  $V$ . Show three different versions of the loss curve: one for a large size of the predator population, one for a medium size of the predator population, and one for a small size of the predator population. Label each curve.

c. Suppose that the predator population is kept constant at  $P = 11$ . What stable equilibrium value is reached by the victim population?

d. Suppose that the predator population is kept constant at  $P = 25$ . What stable equilibrium value is reached by the victim population?

e. For what value of  $P$  will the victim population approach an equilibrium value of approximately 95?

f. For what value of  $P$  will the victim population approach an equilibrium value of approximately 130?