

**Math 1B, Prof Zworski**  
Section 9.7

1. (a) If we set  $y = 0$  in the given equation, we get  $dx/dt = -0.5x$  which indicates that in the absence of  $y$ ,  $x$  declines with time. This means that  $x$  must be the predator, and  $y$  the prey. The growth of the prey population is restricted only by encounters with the predators (the term  $-0.005xy$ ), and similarly for the predator.  
(b) Reasoning as in part (a), the predator must be  $y$  and the prey must be  $x$ . The growth of predator is restricted only by the term  $0.00008xy$  (encounters with prey), while the prey population is restricted by both the terms  $-0.006xy$  (encounters with predators) and  $-0.0002x^2$  (carrying capacity of 1000).
2. (a) An increase in  $x$  makes the term  $0.00004xy$  larger, and hence the rate  $dy/dt$  larger. Similar reasoning for  $y$ . So, this is a cooperation model  
(b) Same reasoning as in (a). This is a competition model.