

A solution to the differential equation  $\frac{dy}{dt} = ky(M - y)$  is  $y = \frac{M}{1 + be^{Mkt}}$

where  $M$  is the max carrying capacity,  $k$  is a positive constant that controls rate of growth.  $b$  is a constant that helps to control where the curve crosses the  $y$  axis, helpful since  $a = \frac{M}{1 + b}$  is the  $y$ -intercept, or initial value.

Usually the AP questions have you do:

- Make it look like  $\frac{dy}{dt} = ky(M - y)$  when it might be  $Mky\left(1 - \frac{y}{M}\right)$  or something else.
  - Find the limit of  $y$  as  $t \rightarrow \infty$
  - Tell when the growth is fastest
  - Given  $M$ ,  $y$  and  $\frac{dy}{dt}$ , find  $k$ .
1. A population  $P(t)$  grows at a rate  $P'(t) = 7.2(3200P - P^2)$ 
    - (a) What is the population as time passes?
    - (b) What is the population when the population is growing the fastest?
  
  2. Free response questions from the past (get them from [apcentral.collegeBoard.org](http://apcentral.collegeBoard.org))
    - (a) 2004 BC 5
    - (b) 2006 Form B BC 5
    - (c) 2008 BC 6
  
  3. Older Multiple choice questions.
    - (a) 1998 BC 26
    - (b) 2003 BC 21
    - (c) 2008 BC 24