

Week 7  
MATH 34B  
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18.2 Let  $y' = ky(1 - y/10)$ ,  $y'(0) = 2$ , and  $y(0) = 5$ .

- (a) What's  $k$ ?
- (b) What's  $y(4)$ ?

18.5 A spherical snowball is melting. The radius after  $t$  hours is  $1 - t$  meters.

- (a) What fraction of the initial mass of the snowball remains after half an hour?
- (b) How quickly is the volume of the snowball changing after half an hour?

18.6 How quickly a leaf grows is proportional how big [ie the surface area] the leaf is. If the area of the leaf grows from  $2\text{cm}^2$  to  $3\text{cm}^2$  in 8 days, how long will it take for the leaf's area to increase to  $5\text{cm}^2$ ?

18.7 Species A doubles every 3 hours and initially there are 5 grams. Species B doubles every 4 hours and initially there are 14 grams.

How long until the two species have the same mass?

19.7 Assume the amount of pollution entering the world's oceans grows exponentially. At the start of 1900 suppose that the instantaneous rate at which pollution enters the oceans is  $10^3$  tons per year, and that the amount doubles every 10 years thereafter. Express the rate that pollution enters, in units of tons per year, at a time  $t$  years after 1900.

Set up an integral that expresses the total amount of pollution which entered during the period 1900 to 1980.

19.8 A hot object cools down according to Newton's Law so that  $t$  hours after the start, the rate that heat leaves is  $76e^{-t/3}$  Joules per hour. How much heat leaves the object during the first 7 hours? [All you need to know is that a Joule is a quantity of heat. In fact, 4.2 Joules is the heat required to raise 1 gram of water 1 degree Celcius]