Notes on Section 2.4.7

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The following are solutions and solution suggestions for some of the problems in this subsection.

1. A disease is infecting a colony of 1000 penguins living on a remote island Let P(t) be

(a)	The model is	
	and	
(b)	The differential equation	is separable.
	is the general solution to	the differential equation.
(c)	The initial condition is	
	SO	

the o	lisease.		
(a)	The model is		
	and		
(b)	The differential equation is separable.		
	L		
	is the general solution.		
(c)			
	SO		
	Thus		
	and		
	This is the solution to the	initial value problem.	

2. A disease is infecting a herd of 100 cows. Let P(t) be the number of sick cows t days after the outbreak. Suppose that 15 cows had the disease initially, and suppose that the disease is spreading at a rate proportional to the number of cows who do not have

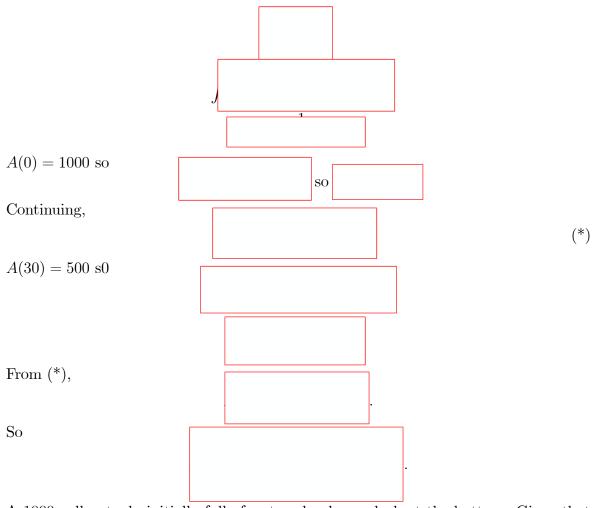
3. A 1000-gallon tank, initially full of water, develops a leak at the bottom. Given that 200 gallons of water leaks out in the first 10 minutes, find the amount of water, A(t) in the tank t minutes after the leak develops if water drains off at a rate proportional to the product of the time elapsed and the amount of water present.

Solution. Solving the d.e. we have applying A(0) = 1000 we have and (*) Using A(10) = 800 we have SOand Putting this value for k into (*) we have SO

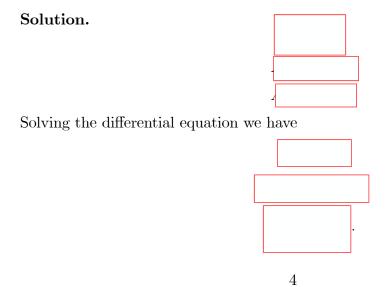
4. A 1000-gallon tank, initially full of water, develops a leak at the bottom. Given that 500 gallons of water leaks out in the first 30 minutes, find the amount of water, A(t) in the tank t minutes after the leak develops if water drains off at a rate proportional to the product of the time elapsed and the square root of the amount of water present.



Solving the differential equation, we have



5. A 1000-gallon tank, initially full of water, develops a leak at the bottom. Given that 300 gallons of water leaks out in the first 20 minutes, find the amount of water, A(t) in the tank t minutes after the leak develops if water drains off at a rate proportional to the square of the amount of water in the tank.



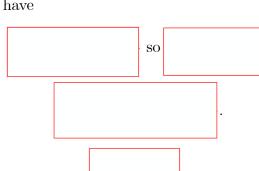
Using A(0) = 1000 this becomes



Using A(20) = 700 we have

and

So



6. Let P(t) be be the number (in millions) of people who become aware of the product by time t.