

Mixing Problems

1. A tank contains 200 liters of a dye solution with a concentration of 1 gram per liter. It will be rinsed with fresh water flowing in at the rate of 2 liters per minute. The solution is stirred well and flows out at the same rate. How long will it take the concentration to reach 1% of its original value?
2. A tank holds 1000 liters of pure water. A brine solution containing 0.1 kg/liter starts to flow into the tank at 6 liters/minute. The solution in the tank is stirred well and flows out at 6 liters/minute. When will the concentration of salt in the tank reach 0.05 kg/liter?
3. A swimming pool with a volume of 10000 gal contains water that is 0.01% chlorine. Starting at time $t = 0$, city water which is 0.001% is pumped in at 5 gal/min and the pool water is pumped out at the same rate. What is the chlorine concentration after 1 hr? When will it be 0.002%?

Answers

1. $100 \ln 100$ minutes
2. $(500 \ln 2) / 3$ minutes
3. 0.0097% 73.24 hr