

4. (10 points) Every year pesticides used on adjacent agricultural land drain off into Lake Michigan. Eventually, scientists predict that the lake will become saturated with pesticides. As a result, the amount of pesticides in the lake $P(t)$ (in parts per million) is given as a function of time, t , in years since 2000, by

$$P(t) = a(1 - e^{-kt}) + b$$

where a, b and k are positive constants. Assume the saturation level of the lake for pesticides is 50 parts per million.

- (a) If in the year 2000 the pesticide level of Lake Michigan was 5 parts per million, find a and b .
- (b) Find k if the pesticide level was increasing at a rate of 3 parts per million per year in the year 2000.
- (c) When the pesticide level reaches 30 parts per million, fish from the lake cannot be consumed by humans. In what year will the pesticide level in the lake reach 30 parts per million?