

1. The nonhomogeneous equation $y' + p(x)y = r(x)$ has the general solution in the following form of an integral

$$y(x) = e^{-h(x)} \left[\int e^{h(x)} r(x) dx + c \right]$$

where $h(x) = \int p(x) dx$. Please show this solution formula! (20%)

2. The thickness of a bottomset bed at the foot of a delta can often be well approximated by the expression

$$t = t_0 \exp(-x/x_0) \quad (\text{EQ.1})$$

where t is thickness, x is distance from the bottomset bed start and t_0 and x_0 are constants.

- (a) Imagine approximating this sedimentary bed in cross-section by a series of rectangles of thickness t_i and width Δx (Fig. 1). What is the area of each rectangle? (5%)
- (b) Now write down an approximate sum for the cross-sectional area of the entire bottomset bed with a series of N rectangles of equal width Δx but different thickness. (5%)
- (c) By considering the limiting case of an infinite number of infinitesimally wide rectangles, write down and evaluate an integral equation giving the total cross-sectional area. (10%)
- (d) If the present-day rate of sediment supply is $10 \text{ m}^2/\text{year}$ and $x_0 = 5 \text{ km}$ and $t_0 = 1 \text{ m}$, estimate the time taken to form the bed assuming the sediment supply rate has not altered through time. (10%)

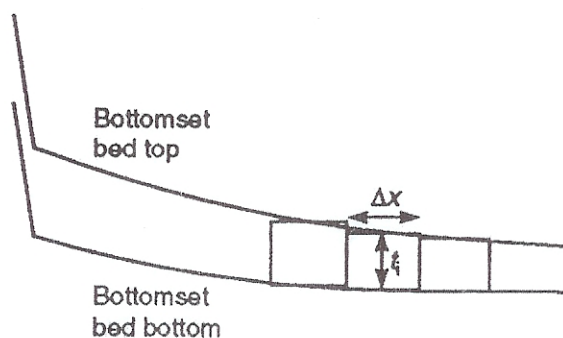


Figure 1