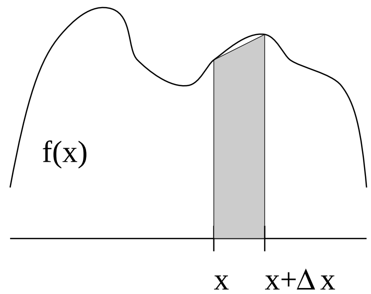
Homework #3: Numerical Integration

- The simplest way to perform this integration is called the trapezoid method. One divides the x range into small segments Δx and assumes that for each Δx

$$\int_{x}^{x+\Delta x} f(x)dx \approx \frac{(f(x+\Delta x)+f(x))\Delta x}{2} \tag{1}$$



Area( )=0.5 * (f(x+Δ x) + f(x)) *Δ x

The full integral is obtained by summing up all the areas of each Δx. Note, that the edge points have to be treated carefully.

- Write a program that calculates the following integral:

$$\int_{-2.5}^{2} f(x)dx \tag{2}$$

where

$$f(x) = 10x^2 - x^3 \tag{3}$$

- Your program should compare the results of the numerical integration using the trapezoid method with the analytical results as obtained by calculating $F = \int_{-2.5}^{2} f(x)dx$. The number of intervals must be large enough so that the results will fall within an accuracy of 10^{-3} from each other.

- **General guidelines for submitting C programs:**
The final program should contain a **reasonable** amount of **comment lines** which explain the program. Try to address the following points:
  - Describe the main variables of the program.
  - Explain your algorithm (briefly).
  - Explain non-trivial C lines which might confuse the reader.

Good luck