Task 1 & 2

Consider function $f(x) = \sin x$ in a period $[a, b]$, then approximate $f(x)$ by piecewise function

Task 1

- Step1: Draw the diagram of $f(x)$
- Step2: Cut $[a, b]$ into a set of N intervals $I_j = [x_j, x_{j+1}]$
  - $x_0 = a, x_N = b$
  - $j = 0, 1, 2, \ldots, N$
  - Set $a = -10, b = 10$
- Step3: Plot piecewise functions $\tilde{f}(x)$
  - $\tilde{f}(x) = f(x_{j+\frac{1}{2}})$
  - $x \in [x_j, x_{j+1}]$
- Step4:
  $k\ N_x\ e_k = \sum_{j=0}^{n-1} \int_{x_j}^{x_{j+1}} |\tilde{f}(x) - f(x)|\ log_2(\frac{e_k}{e_{k-1}})$
  1 10
  2 20
  3 40
  4 80

Task 2

- Step1: Draw the diagram of $f(x)$
- Step2: Cut $[a, b]$ into a set of N intervals $I_j = [x_j, x_{j+1}]$
  - $x_0 = a, x_N = b$
  - $j = 0, 1, 2, \ldots, N$
  - $\triangle x = \frac{b-a}{N}$
  - Set $a = -10, b = 10$
- Step3: Plot piecewise functions $\overline{f}(x)$
  - $\overline{f}(x) = \frac{1}{\triangle x} \int_{I_j} f(x)dx$
  - $x \in [x_j, x_{j+1}]$
- Step4:
  $k\ N_x\ e_k = \sum_{j=0}^{n-1} \int_{x_j}^{x_{j+1}} |\overline{f}(x) - f(x)|\ log_2(\frac{e_k}{e_{k-1}})$
  1 10
  2 20

3 40
4 80