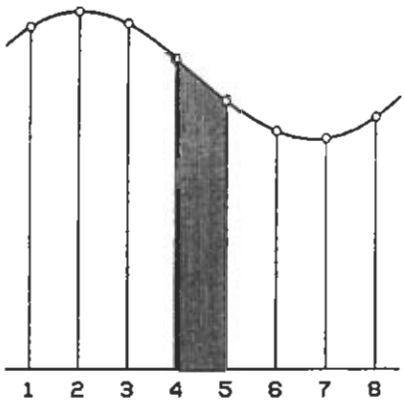
18.330 AMENDED PSet 4

Due in class: Fri 05 Mar 04

(10) Somewhat in the spirit of **Newton-Cotes**, suppose we wished to evaluate accurately for any 7th-degree polynomial $f(x)$ its integral between $x = 4$ and 5 from just the eight samplings at the places shown.



What rational numbers $w_k = p/q$ should we then use for the weights in

$$\int_{x=4}^{5} f(x)\,dx = \sum_{k=1}^{8} w_k\, f(k) \quad ?$$

(11) Don't let the sum $1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \ldots$ drive you bananas!

Instead try several tail-integration and/or Aitken strategies — or, best of all, employ **Euler-Maclaurin** — to conquer it smartly to at least 9 decimals.

(12) Ditto for $P = \prod_{n=3}^{\infty} \cos(\pi/n) = \cos 60^\circ \cdot \cos 45^\circ \cdot \cos 36^\circ \cdot \cos 30^\circ \ldots$