Problem Set #26

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Problem 3

$$A = \int_0^1 2\pi x\sqrt{1+x^3}\,\mathrm{d}x = \int_0^1 f(x)\,\mathrm{d}x$$

Let $f(x) = 2\pi x\sqrt{1+x^3}$. $\Delta x = 1/5$.

$$\begin{aligned} A \approx M_5 &= \sum_{k=1}^{5} f\left(\frac{x_{k-1}+x_k}{2}\right)\Delta x \\ &= \frac{1}{5}\left(f\left(\frac{0+0.2}{2}\right) + f\left(\frac{0.2+0.4}{2}\right) + f\left(\frac{0.4+0.6}{2}\right) + f\left(\frac{0.6+0.8}{2}\right) + f\left(\frac{0.8+1}{2}\right)\right) \\ &= \frac{1}{5}\left(f(0.1)+f(0.3)+f(0.5)+f(0.7)+f(0.9)\right) \approx \boxed{3.681} \end{aligned}$$