

Estimating Integrals

Consider the integral:

$$\int_{0.2}^{0.8} x^{\frac{1}{3}} dx$$

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The exact solution can be calculated from calculus as

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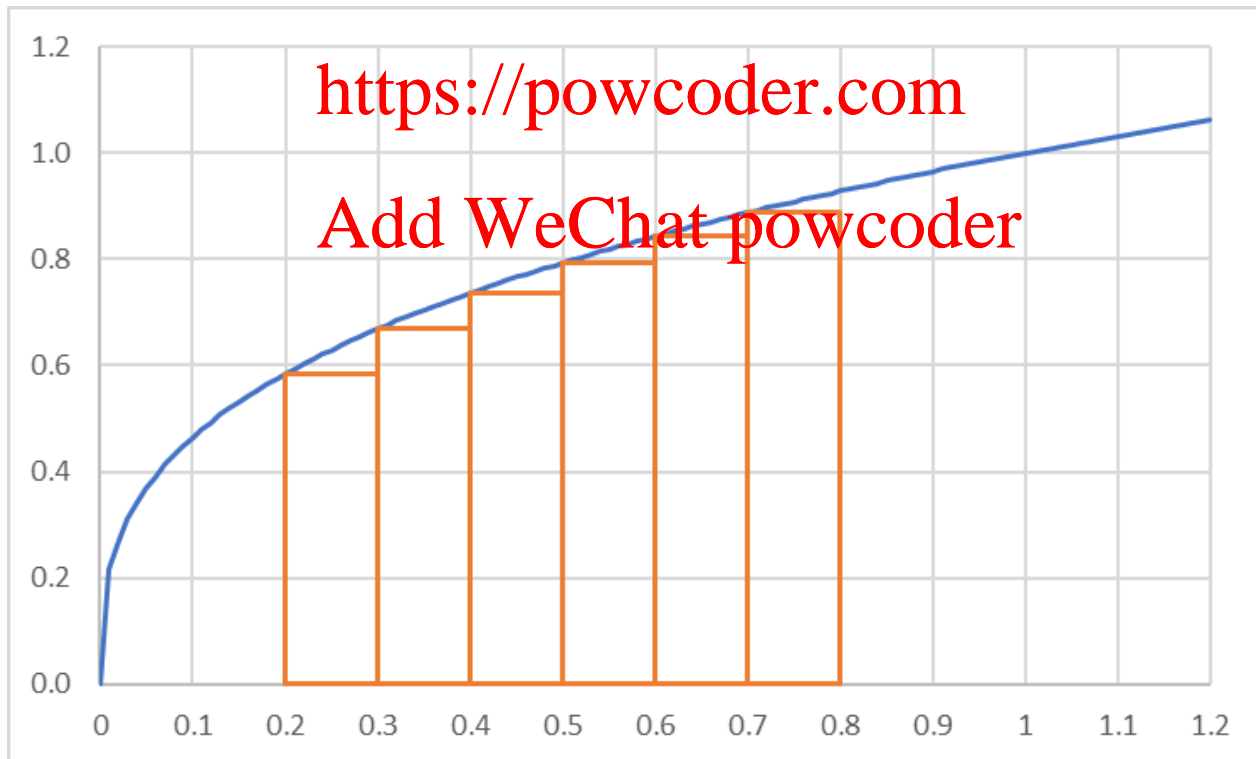
$$\frac{3}{4}(0.8)^{\frac{4}{3}} - \frac{3}{4}(0.2)^{\frac{4}{3}} = 0.46927$$

(Problem continues on next page)

Estimating Integrals (cont.)

Recall that integrals can be estimated using Reiman Sums. An example is shown graphically, using rectangles with widths of 0.1 and height equal to the value of the function being integrated.

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Estimating Integrals (cont.)

Using rectangles of width 0.1, the integral is estimated by summing up the areas of the rectangles:

$$R = 0.1 * \left(0.2^{\frac{1}{3}} + 0.3^{\frac{1}{3}} + 0.4^{\frac{1}{3}} + 0.5^{\frac{1}{3}} + 0.6^{\frac{1}{3}} + 0.7^{\frac{1}{3}} \right) = 0.45161$$

The smaller the width of rectangle that is used, the closer the estimate will be. When rectangles of width 0.01 are used, the estimate is 0.46753.

Estimating Integrals (cont.)

First, use the Do Loop to estimate the integral from the example. Calculate three separate estimates, using rectangles of widths 0.1, 0.01, and 0.000001.

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Second, use the Do Loop to estimate the integral below, for which the exact solution is difficult to calculate. Use rectangles of width 0.000001.

$$\int_0^1 \ln(3 + \cos(10x))^{3x+1} dx$$