

Homework #12 Solutions

Problem

Using the trapezoidal rule, estimate the area under the curve $f(x) = x^3$ from $x = 0$ to $x = 1$ using a partition size of $n = 10$. Start by constructing a table of x_i and $f(x_i)$ values and then perform the calculation from the values in the table.

x_i	$f(x_i)$	multiplier	term
0	0	1	0
$\frac{1}{10}$	$\frac{1}{1000}$	2	$\frac{2}{1000}$
$\frac{2}{10}$	$\frac{8}{1000}$	2	$\frac{16}{1000}$
$\frac{3}{10}$	$\frac{27}{1000}$	2	$\frac{54}{1000}$
$\frac{4}{10}$	$\frac{64}{1000}$	2	$\frac{128}{1000}$
$\frac{5}{10}$	$\frac{125}{1000}$	2	$\frac{250}{1000}$
$\frac{6}{10}$	$\frac{216}{1000}$	2	$\frac{432}{1000}$
$\frac{7}{10}$	$\frac{343}{1000}$	2	$\frac{686}{1000}$
$\frac{8}{10}$	$\frac{512}{1000}$	2	$\frac{1024}{1000}$
$\frac{9}{10}$	$\frac{729}{1000}$	2	$\frac{1458}{1000}$
1	$\frac{1000}{1000}$	1	$\frac{1000}{1000}$

$$\int_0^1 x^3 dx \approx \frac{1-0}{2(10)} \left(\frac{5050}{1000} \right) = 0.2525$$

Note that the actual value is:

$$\int_0^1 x^3 dx = \left[\frac{1}{4} x^4 \right]_0^1 = \frac{1}{4} = 0.2500$$