

n = the number of trapezoids for the summation

h = the length of $x_i - x_{i-1}$

Trapezoidal Method

$$\int_0^{0.5} \sin(\pi * x) dx$$

The value of $\int_0^{0.5} \sin(\pi * x) dx = 0.318309886$

Area under the curve using the Trapezoidal Method of integration

	h	h/2	h/4	h/8	h/16	h/32	h/64
	n = 1	n = 2	n = 4	n = 8	n = 16	n = 32	n = 64
Area	0.25	0.3017767	0.3142087	0.3172866	0.3180542	0.3182459	0.3182939

	h/128	h/256	h/512				
	n = 128	n = 256	n = 512				
Area	0.3183059	0.3183089	0.3183096				

Using the trapezoidal method of integration :

The real value of $\int_0^{0.5} \sin(\pi * x) = 0.318310989$ in order for us to use the Trapezoidal

Method of integration to get to the seventh decimal place accuracy we had to divide the graph into ten pieces to come close to the result. The area calculated using n = 512 is 0.3183096 compared to the real result which was 0.318310989. The calculated difference is $1.389 \epsilon^{-6}$.

$$\int_{0.5}^2 e^{(-x^2/2)} dx$$

The value of $\int_{0.5}^2 e^{(-x^2/2)} dx = 0.71636279$

Area under the curve using the Trapezoidal Method of integration

	h	h/2	h/4	h/8	h/16	h/32	h/64
	n = 1	n = 2	n = 4	n = 8	n = 16	n = 32	n = 64

Area	0.7633741	0.7250621	0.7184033	0.7168651	0.7164879	0.7163940	0.7163706
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	h/128	h/256	h/512	h/1024	h/2048	h/4096	
	n = 128	n = 256	n = 512	n = 1024	n = 2048	n = 4096	
Area	0.7163647	0.7163632	0.7163629	0.7163628	0.7163628	0.7163627	

For this equation it took $n = 4096$, where n is the number of trapezoids used to get to a seven decimal place accuracy. The difference between the real value of the integral and $n = 4096$ is $0.71636279 - 0.7163627 = 0.00000009$.

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$$\int_0^1 \text{Sinc}(2 * \pi * x) dx, \text{ where } \left\{ \frac{\sin(2 * \pi * x)}{(2 * \pi * x)} \text{ if } x \neq 0, 1 \text{ if } x = 0 \right\} = 1.22570483$$

	h	h/2	h/4	h/8	h/16	h/32	h/64
	n = 1	n = 2	n = 4	n = 8	n = 16	n = 32	n = 64
Area	0.5	-0.166666	0.0111111 1	-0.000176	6.9163468	-6.760847	1.6510005

Romberg Method

$$\int_0^{1/2} \sin(\pi * x) dx$$

level	Iteration 0	Iteration 1	Iteration 2	Iteration 3	Iteration 4
1	0.25	0.301776695	0.314208718	0.3172865746	0.31805418
2	0.3190355937 2	0.31835272	0.31831252	0.318310050	
4	0.3183072013	0.3183098467 8	0.3183098855 7		
8	0.3183098887 7	0.3183098861			
16	0.3183098861 8				

$$\int_{0.5}^2 e^{-x^2/2} dx$$

level	Iteration 0	Iteration 1	Iteration 2	Iteration 3	Iteration 4
1	0.7633741393 6	0.7250620910	0.7184032654 1	0.716865093	0.7164878887 4
2	0.7122914082 2	0.7161836568 7	0.7163523694 1	0.7163621538 5	
4	0.7164431401 2	0.7163636169 2	0.7163628061 4		
8	0.7163623546	0.7163627932 7			
16	0.7163627949				

$$\int_0^1 \text{Sinc}(2 * \pi * x) dx, \text{ where } \{ \text{Sin}(2 * \pi * x) / (2 * \pi * x) \text{ if } x \neq 0, 1 \text{ if } x = 0 \}$$