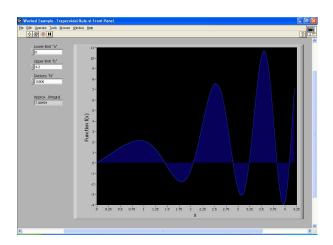# Worked Example: The Trapezoidal Rule

The *trapezoidal rule* is a numerical integration scheme in which the area under a curve is approximated by a collection of trapezoidal subdivisions whose individual areas are added together. Consider the integral of some function *f(x)* over the limits from $x = a$ to $x = b$. If this integral is to be approximated by *N* trapezoidal divisions, then the approximate value of the integral is given by:
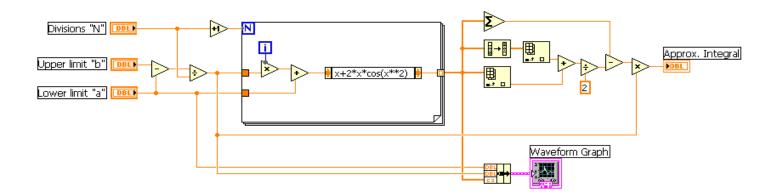
$$\int_{x=a}^{x=b} f(x)\,dx \cong -\frac{\Delta x}{2} \cdot [f(a) + f(b)] + \Delta x \cdot \sum_{i=0}^{i=N} f(a + i \cdot \Delta x)$$

The parameter *Δx* is the assumed uniform width of the divisions:

$$\Delta x \equiv \frac{b - a}{N}$$

Using the formulation above, create a VI to approximate the integral of the function $f(x) = x + 2x \cdot cos(x^2)$, between any two limits *a* and *b*, and for any desired divisions *N*. Note that in general, numerical integration techniques are most practical for use when the exact answer is otherwise indeterminate, or for fundamentally discrete data.