1-2-3 Method – Integration by Parts

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In Figure 1.1., the 1-2-3 Method for simplified Integration by Parts is presented as an improved shortcut for actuarial students to facilitate passing Exam P. Only 3 calculus steps are required (Figure 1.1.).

**Figure 1.1. 1-2-3 Method – Integration by Parts**

The formula simplifies traditional integration by parts, a tedious and time consuming calculus process, reducing errors by half, and speeding calculation by up to 200-300%. Therefore, calculation of the antiderivative of *g(x)* occurs only once, substituted back into the first *g(x)*. Although loosely based on an existing user-unfriendly calculus method, to the best of the author’s knowledge, this is the first incidence of the more precise expression, in the actuarial sciences. The key advantage of the 1-2-3 Method is that only 2 of the 4 functions require calculus calculations, in 3 simple steps (expression 1.1.):

**Example:**

**Previous SOA Exam P tests included several similar problems:**

Find = *F(x)* = ?

.

Then it follows: .

**Solution:**

**Calculus Steps 1 & 2:**

Take the derivative of the second *f(x)* and antiderivative of the second *g(x)* (expression 1.2.):

Next, substitute the result into the first g(x):

, and f(x) = x remains unchanged:

**Calculus Step 3:**

Find the antiderivative of the product:

Simplify:

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**Compressed Steps:**

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