Ex: Fig. 1 below shows an example of using differentiation and integration to find the convolution of two rectangle functions. Note the following features of the solution:

1) The convolution of an impulse function with any other function makes a copy of that other function. It is often simpler to differentiate only one of the two functions being convolved until impulses are obtained. Convolving with these impulses makes copies of the other function.

2) Either of the functions in Fig. 1 may be differentiated, but differentiating the unit-height step function yields unit-area impulses, and the copies of the other rectangle function are replicated without scaling.

3) The net horizontal shift of the two rectangle functions is $-\frac{1}{2}+\frac{3}{2}=1$, which becomes the horizontal center point of the final triangle function.

4) Based on the formula for convolution, with the reversal of one function, sliding it across the other function, and multiplying the functions, we have that the peak height of the final result occurs when the rectangles are precisely aligned. The product at that point has area two. Final result in lower right graph.

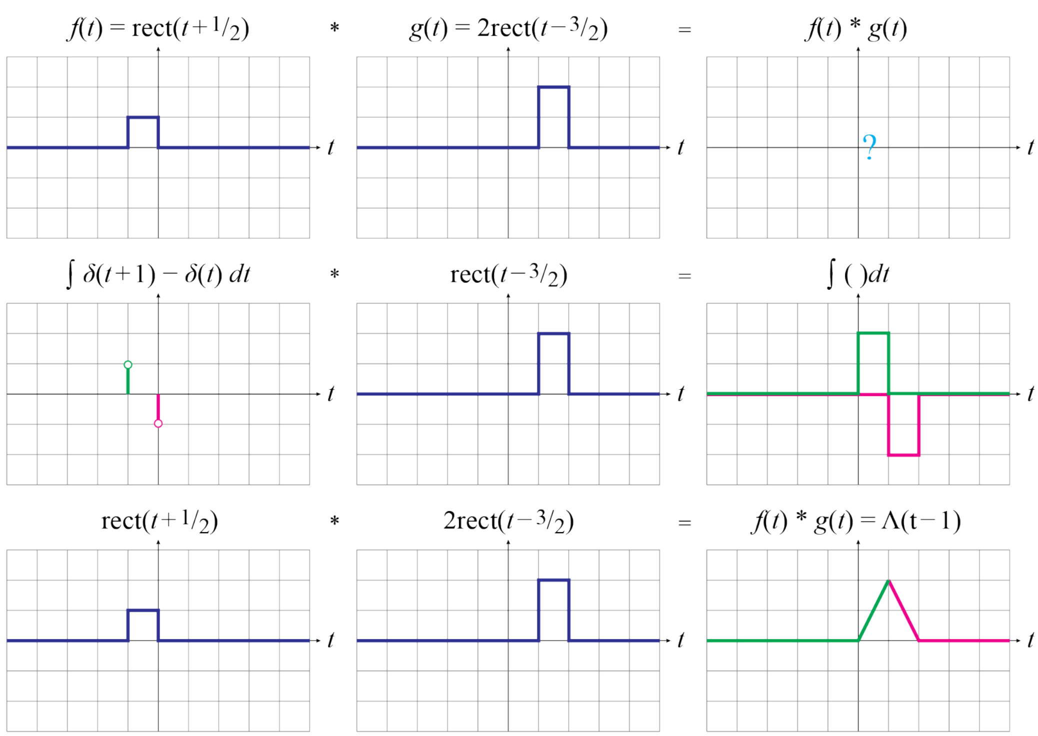

Fig. 1. Convolution by differentiation, convolution, integration.