Composite Trapezoidal Rule

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composite_trap.m is designed for computing the following integral numerically.

$$\int_0^{t*} \sqrt{1 + [s'(t)]^2} dt$$

where

$$s(t) = s_0 - \frac{mg}{k}t + \frac{m^2 g}{k^2}(1 - e^{-\frac{kt}{m}})$$

$m = 0.25lb$, $s_0 = 300ft$, $g = 32.17\frac{ft}{s^2}$ and $k = 0.1\frac{lb.s}{ft}$ and $s(t*) = 0$.
I used Bisection Method and Newton's Method Combined in find_t.m. func.m includes the $s(t)$ function.

composite_trap.m takes 5 parameters such as function name, lower bound, upper bound, tolerance, upper bound for error. Upper bound for error is calculated through $max_{t\in[0,t*]}\frac{d^2 \sqrt{1+[s'(t)]^2}}{dt^2}$ It turns out to be 1035.
It applies Composite Trapezoidal Rule after finding number of subintervals by formula below. It returns integral value and number of subintervals.

$$ceil(sqrt((ubound/12) * ((b - a)^3)/tol))$$

One can use the following command to run the program.

[I,m]=composite_trap("func",0,find_t(),10^{-10},1035)