Program 7.1 (Composite Trapezoidal Rule). To approximate the integral

$$\int_a^b f(x)\,dx \approx \frac{h}{2}(f(a) + f(b)) + h \sum_{k=1}^{M-1} f(x_k)$$

by sampling $f(x)$ at the $M + 1$ equally spaced points $x_k = a + kh$, for $k = 0, 1, 2, \ldots, M$. Notice that $x_0 = a$ and $x_M = b$.

Example 7.7. Consider $f(x) = 2 + \sin(2\sqrt{x})$. Investigate the error when the composite trapezoidal rule is used over $[1, 6]$ and the number of subintervals is 10, 20, 40, 80, and 160.

```
function s=traprl(f,a,b,m)
%Input - f is the integrand input as a string 'f'
%- a and b are upper and lower limits of integration
%- m is the number of subintervals
%Output - s is the trapezoidal rule sum

a=1;
b=6;
m=160;
h=(b-a)/m;
s=0;
for k=1:(m-1)
    x=a+h*k;
    s=s+feval('f',x);
end
s=h*(feval('f',a)+feval('f',b))/2+h*s;

function g=f(x)
g=2+sin(2*sqrt(x));

% if a=1;b=6;m=10;f=2+sin(2*sqrt(x)); then the result:
%  ans= 8.1939
% if a=1;b=6;m=160;f=2+sin(2*sqrt(x)); then the result:
%  ans= 8.1835
```