

```
(** FORMULE DI NEWTON-COTES COMPOSTE **)
```

```
f[x_] := Exp[x];  
a = 0.; b = 1.;  
true1 = Integrate[f[x], x];  
true = Integrate[f[x], {x, 0, 1}] // N  
x[0] = a;  
n = 20;  
x[n] = b;  
h = (b - a) / n;  
Do[x[i + 1] = x[i] + h, {i, 0, n - 2}];  
sum = 0.0;  
Do[sum += f[x[i]], {i, 1, n - 1}];  
trap = 0.5 * h * (f[a] + 2.0 * sum + f[b])  
err = Abs[trap - true]
```

1.71828

1.71864

0.00035796

```
w[0] = 1.; w[n] = 1.;  
Do[w[i] = 4., {i, 1, n - 1, 2}]  
Do[w[i] = 2., {i, 2, n - 2, 2}]  
sum = 0.0;  
Do[sum += w[i] * f[x[i]], {i, 0, n}]  
simps = h * sum / 3.  
err = Abs[simps - true]
```

1.71828

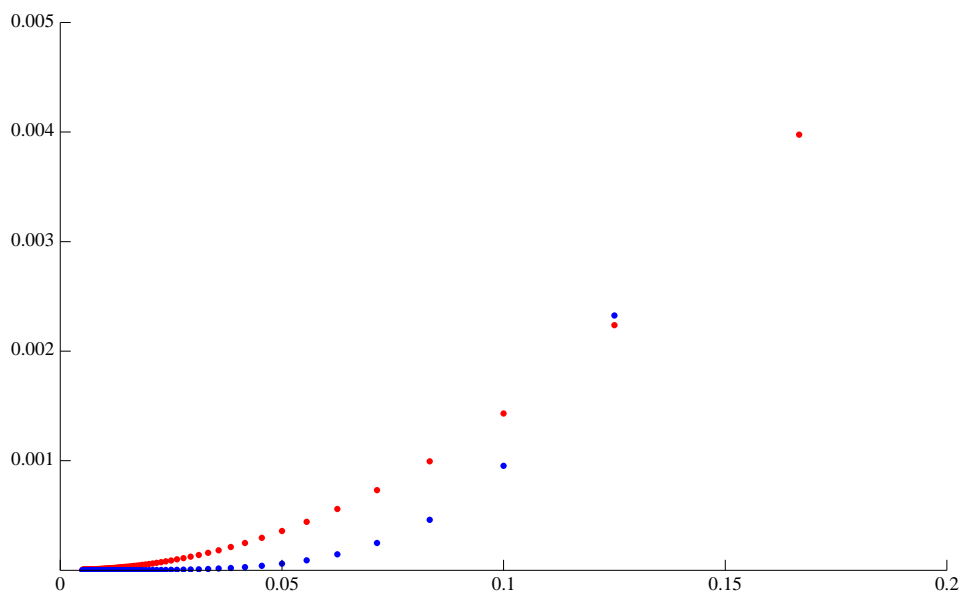
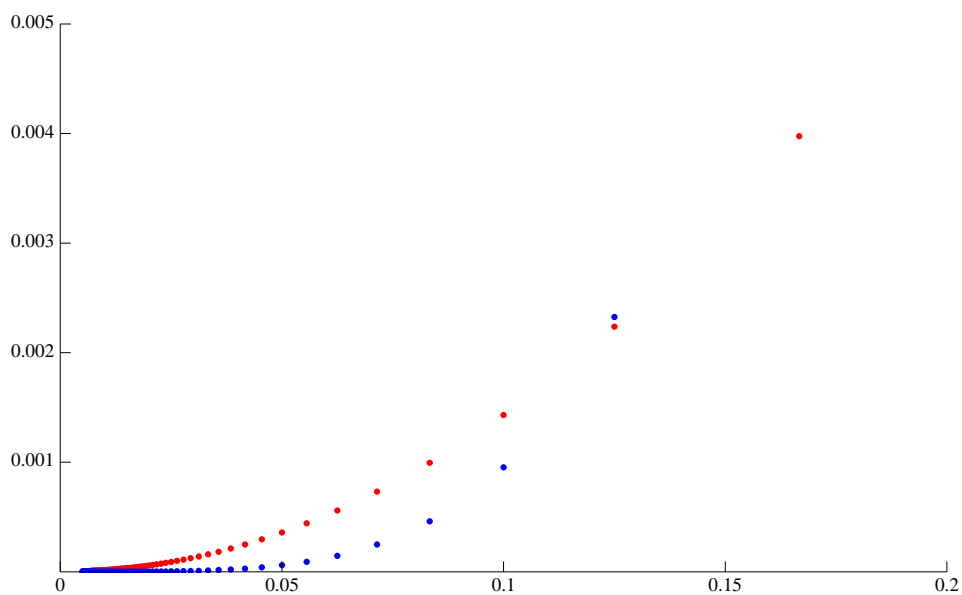
$5.96448 \times 10^{-8}$

```
ticks2 = {{0, 0.05, 0.1, 0.15, 0.2}, {0.001, 0.002, 0.003, 0.004, 0.005}};  
prange = {{0, 0.2}, {0, 0.005}};
```

```

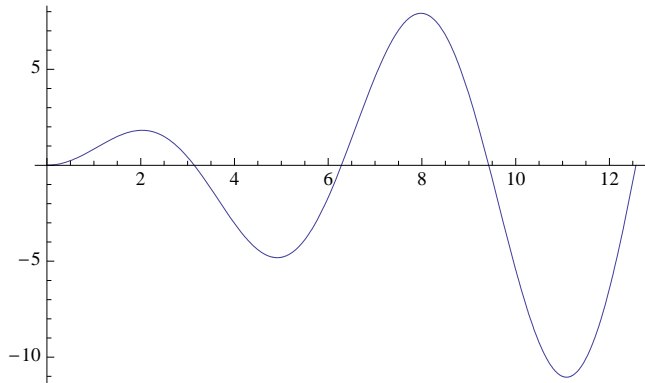
nmax = 200;
Do[x[n] = b;
  h = (b - a) / n; hh[n] = h;
  Do[x[i + 1] = x[i] + h, {i, 0, n - 2}];
  sum = 0.0;
  Do[sum += f[x[i]], {i, 1, n - 1}];
  trap = 0.5 * h * (f[a] + 2.0 * sum + f[b]);
  errtrap[n] = Abs[trap - true];
  w[0] = 1.; w[n] = 1.;
  Do[w[i] = 4., {i, 1, n - 1, 2}];
  Do[w[i] = 2., {i, 2, n - 2, 2}];
  sum = 0.0;
  Do[sum += w[i] * f[x[i]], {i, 0, n}];
 _simps = h * sum / 3.;
  errsimps[n] = Abs[simps - true], {n, 4, nmax, 2}]
pl1 = ListPlot[Table[{hh[n], errtrap[n]}, {n, 4, nmax, 2}],
  PlotStyle -> RGBColor[1, 0, 0], PlotRange -> prange, Ticks -> ticks2];
pl2 = ListPlot[Table[{hh[n], 1000. * errsimps[n]}, {n, 4, nmax, 2}],
  PlotStyle -> RGBColor[0, 0, 1], PlotRange -> prange, Ticks -> ticks2];
Show[
  pl1,
  pl2]

```



```
(* SECONDA FUNZIONE *)
```

```
f[x_] := x * Sin[x];
Plot[f[x], {x, 0, 4. Pi}]
```



```
a = 0.; b = 4. * Pi;
true1 = Integrate[f[x], x];
true = Integrate[f[x], {x, 0, b}] // N
-12.5664
```

```
x[0] = a;
n = 200;
x[n] = b;
h = (b - a) / n;
Do[x[i + 1] = x[i] + h, {i, 0, n - 2}];
sum = 0.0;
Do[sum += f[x[i]], {i, 1, n - 1}];
trap = 0.5 * h * (f[a] + 2.0 * sum + f[b])
err = Abs[trap - true]
-12.5622
```

```
0.00413444
```

```
w[0] = 1.; w[n] = 1.;
Do[w[i] = 4., {i, 1, n - 1, 2}]
Do[w[i] = 2., {i, 2, n - 2, 2}]
sum = 0.0;
Do[sum += w[i] * f[x[i]], {i, 0, n}]
simps = h * sum / 3.
err = Abs[simps - true]
-12.5664
```

```
1.08858 × 10-6
```

```

ticks2 = {{0, 0.05, 0.1, 0.15, 0.2}, {0.01, 0.02, 0.03, 0.04}};
prange = {{0, 0.15}, {0, 0.04}};
nmax = 1000;
Do[x[n] = b;
  h = (b - a) / n; hh[n] = h;
Do[x[i + 1] = x[i] + h, {i, 0, n - 2}];
sum = 0.0;
Do[sum += f[x[i]], {i, 1, n - 1}];
trap = 0.5 * h * (f[a] + 2.0 * sum + f[b]);
errtrap[n] = Abs[trap - true];
w[0] = 1.; w[n] = 1.;
Do[w[i] = 4., {i, 1, n - 1, 2}];
Do[w[i] = 2., {i, 2, n - 2, 2}];
sum = 0.0;
Do[sum += w[i] * f[x[i]], {i, 0, n}];
simps = h * sum / 3.;
errsimps[n] = Abs[simps - true], {n, 4, nmax, 2}]
p11 = ListPlot[Table[{hh[n], errtrap[n]}, {n, 4, nmax, 2}],
  PlotStyle -> RGBColor[1, 0, 0], PlotRange -> prange, Ticks -> ticks2];
p12 = ListPlot[Table[{hh[n], 1000. * errsimps[n]}, {n, 4, nmax, 2}],
  PlotStyle -> RGBColor[0, 0, 1], PlotRange -> prange, Ticks -> ticks2];
Show[
  p11,
  p12]

```

