1.

$$\int_1^{10} v(t)\,dt = \int_1^{2} v(t)\,dt + \int_2^{4.5} v(t)\,dt + \int_{4.5}^{6} v(t)\,dt + \int_6^{9} v(t)\,dt + \int_9^{10} v(t)\,dt$$

$$= \frac{1}{2}(5+6) + \frac{5}{12}(6+4\times 5.5+7) + \frac{3}{4}(7+8.5) + \frac{3}{8}(8.5+3\times 8+3\times 6+7) + \frac{1}{6}(7+4\times 7+5)$$

$$= \frac{11}{2} + \frac{175}{12} + \frac{93}{8} + \frac{345}{16} + \frac{20}{3}$$

$$= 59.9375$$

2.

```
>> format short
>> x = linspace( 0.78, 1, 7 )

x =

  1 至 5 列

    0.7800    0.8167    0.8533    0.8900    0.9267

  6 至 7 列
```

```
    0.9633    1.0000

>> y = cos(x)./sqrt(1-x.^2)

y =

  1 至 5 列

    1.1360    1.1864    1.2611    1.3804    1.5976

  6 至 7 列

    2.1274       Inf

>> format long
>> h = (1-0.78)/6

h =

   0.036666666666667

>> 6*h/20*(11*y(2) - 14*y(3) + 26*y(4) - 14*y(5) + 11*y(6))

ans =

   0.355525685422171
```

3.

$I_{1,1}$:

```
>> 9*exp(6)/2

ans =

     1.815429570717308e+03
```

$I_{2,1}$:

```
>> 9*(exp(3)+exp(6))/4

ans =

     9.529072434358262e+02
```

$I_{3,1}$:

```
>> 9*exp(3/2)/16+9*exp(3)/8+27*exp(9/2)/16+9*exp(6)/8

ans =

     6.308784808896089e+02
```

$I_{4,1}$:

```
>>
9*exp(3/4)/64+9*exp(3/2)/32+27*exp(9/4)/64+9*exp(3)/16+45*exp(15/4)/64+27*exp(9/2)/32+63*exp(2
1/4)/64+9*exp(6)/16

ans =

     5.372258884233623e+02
```

Therefore, we can have $I_{2,2}, I_{3,2}, I_{3,3}, I_{4,2}, I_{4,3}, I_{4,4}$

To summarize:

1815.429571			
952.907243	665.399800		
630.878481	523.535560	514.399800	
537.225888	506.008357	504.839876	504.69324

The true value is 504.5306

Et=|504.5306 – 504.69324|/|504.5306| = 0.000312 = 0.0312%

Ea=|504.69324-514.399800|/|504.69324| = 0.0192 = 1.92%

4.

4 $f(x_0+2h) = f(x_0) + 2hf'(x_0) + \frac{4h^2}{2} f''(x_0) + \frac{8h^3}{6} f'''(x_0) + \frac{16h^4}{24} f^{(4)}(x_0)$
$+ \frac{32h^5}{120} f^{(5)}(x_0) + O(h^6)$

$f(x_0+h) = f(x_0) + hf'(x_0) + \frac{h^2}{2} f''(x_0) + \frac{h^3}{6} f'''(x_0) + \frac{h^4}{24} f^4(x_0) + \frac{h^5}{120} f^5(x_0)$
$+ O(h^6)$

$f(x_0-h) = f(x_0) - hf'(x_0) + \frac{h^2}{2} f''(x_0) - \frac{h^3}{6} f'''(x_0) + \frac{h^4}{24} f^4(x_0) - \frac{h^5}{120} f^5(x_0) + O(h^6)$

$f(x_0-2h) = f(x_0) - 2hf'(x_0) + \frac{4h^2}{2} f''(x_0) - \frac{8h^3}{6} f'''(x_0) + \frac{16h^4}{24} f^4(x_0) - \frac{32h^5}{120} f^5(x_0) + O(h^6)$

Then, $f(x_0+2h) - 2f(x_0+h) + 2f(x_0-h) - f(x_0-2h) = 2h^3 f'''(x_0) + \frac{h^5}{120} f^5(x_0) + O(h^6)$

$f'''(x_0) = \frac{1}{2h^3}\left(f(x_0+2h) - 2f(x_0-h) + 2f(x_0+h) - f(x_0-2h)\right) - \frac{h^2}{4} f^5(x_0) + O(h^3)$

That is $C = -\frac{1}{4}$

|