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> # Prof. Dr. Serkan Dağ
> # ME 310 Numerical Methods
> # File 10.3
> # Simpson's 1/3 rule

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> restart :
> Digits := 16 :

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> # Define the function to be integrated

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> F := 1.6·x - 0.045·x2 :
> theta := 0.8 + 0.125·x - 0.009·x2 + 0.0002·x3 :
> f := F·cos(theta);

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$$f := (1.6x - 0.045x^2) \cos(0.8 + 0.125x - 0.009x^2 + 0.0002x^3)$$

(1)

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> # Integration limits

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> x0 := 0. :
> xn := 30. :

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> # Number of integration segments
> # n has to be even

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> n := 32 :
> h := (xn - x0) / n :
> x1 := x0 + h :
> x2 := x0 + 2·h :

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> sum1 := 0. :
> sum2 := 0. :

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> # Evaluate the sums

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> for i from 1 by 2 to n - 1
> while true do
>   sum1 := sum1 + subs(x=x1,f) :
>   x1 := x1 + 2·h :
> end do:

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> for i from 2 by 2 to n - 2
> while true do
>   sum2 := sum2 + subs(x=x2,f) :
>   x2 := x2 + 2·h :
> end do:

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> # Evaluate the integral

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> res := evalf( ( (xn - x0) · (subs(x=x0,f) + 4·sum1 + 2·sum2 + subs(x=xn,f) ) ) / (3·n) );

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$$res := 66.92232668288405$$

(2)

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