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# Prof. Dr. Serkan Dağ
# ME 310 Numerical Methods
# File 11.2
# Three-Point Gauss-Legendre Quadrature
# f: the function to be integrated
# x0, xn: integration limits
# n: number of integration segments
# X: Gauss points
# C: Gauss weights
# Evaluates the integral: Int(f(x)dx, x = x0 .. xn)
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```
restart :
Digits := 9 :
unprotect(sum) :
```

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# Enter the Gauss points and weights
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```
X := [-0.774596669, 0., 0.774596669];
C := [0.5555556, 0.8888889, 0.5555556];
```

$$X := [-0.774596669,\ 0.,\ 0.774596669]$$
$$C := [0.5555556,\ 0.8888889,\ 0.5555556] \qquad (1)$$

```
# Define the function to be integrated
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```
f := 4·Pi·(1 - x/3)^(1/6)·x;
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$$f := 4\,\pi\left(1-\frac{1}{3}x\right)^{1/6}x \qquad (2)$$

```
# Integration limits
x0 := 0. :
xn := 3. :
# Number of integration segments
n := 128 :
h := (xn - x0)/n :
ai := x0 :
bi := ai + h :
sumint := 0 :
# Evaluate the integral
for i from 1 by 1 to n
while true do

sum := 0 :

for j from 1 by 1 to 3
 while true do

t := X[j] :
u := (bi - ai)/2·t + (bi + ai)/2 :
sum := sum + C[j]·subs(x = u, f) :

end do:
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$$sum := \frac{(bi - ai)}{2} \cdot sum :$$

$ai := ai + h :$
$bi := bi + h :$
$sumint := sumint + sum :$

end do:

```
> evalf(sumint);
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44.7434456 **(3)**

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>
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