

NAME:

Group Number/Instructor name:

ID:

- Duration of the exam: 90 minutes
- Simple calculators are allowed

Question	Grade
I	
II	
III	
IV	
V	
Total	

I) [4 marks]

A) Determine the function $f(x)$, given that $f'(x) = 6x^3 - 3x^2 + x + 4$ and $f(0) = 2$.

B) **Without evaluating the integrals**, show that

$$\int_1^5 (x^2 - 1)dx \geq \int_1^5 (x - 1)dx.$$

C) If $f(x) = x \int_0^x t^2 \sqrt{t+1} dt$, find $f'(x)$.

II) [4 marks] Let $f(x) = 2x + 1$ and let R be the region under the graph of f , from 0 to 5. Let P be the **regular** partition of $[0, 5]$ into n subintervals.

A) Find, in terms of n , the Riemann sum R_P , if $w_k = \frac{5k}{n}$, for $k = 1, 2, \dots, n$.

B) Use Riemann sum in (A) to compute the area of the region R .

III) [2 marks] Using the Simpson's rule with $n = 4$, approximate $\int_1^3 \frac{1}{1+x} dx$.

IV) [2 marks] Find the value of c that satisfies the Integral Mean Value theorem for the function $f(x) = x^2 + 1$ on $[0, 3]$.

V) [8 marks] Compute the following integrals:

(a) $\int (1+x)^2 dx$

(b) $\int_{-1}^4 |x| dx$

(c) $\int \left(\frac{8}{x^2} - 10 \sec^2 x \right) dx.$

$$(d) \int \frac{\cos(\sqrt{x} + 3)}{\sqrt{x}} dx$$

$$(e) \int_0^2 2t^2 \sqrt{4t^3 + 1} dt$$