

**CONCORDIA UNIVERSITY**  
**Department of Mathematics & Statistics**

Course	Number	Sections
Mathematics	205	All
Examination	Date	Duration
Midterm	20 October, 2013	1 h 30 min
<b>Special</b>	Only approved calculators are allowed	
<b>Instructions:</b>	<b>Show all your work for full marks</b>	

1. (5 marks): (a) Approximate the definite integral  $A = \int_3^6 (5 - x^2) dx$  by a right Riemann sum  $R_3$  using 3 approximating rectangles of equal widths.
- (b) Now find the approximation by a left Riemann sum  $L_3$ , again using 3 approximating rectangles of equal widths.
- (b) Calculate the exact value of  $A$  by integrating. Comparing this value with  $\frac{1}{2}(R_3 + L_3)$ . Do your results found in (a) and (b) appear reasonably accurate?

2. (3 marks): (a) Use Part 1 of the Fundamental Theorem of Calculus to find  $F'(x)$  for  $F(x) = \int_{\cos x}^3 \sqrt{1 + t^3} dt$ .

3. (5 marks): Find  $f(t)$ , given  $f'(t) = \frac{10t}{\sqrt[3]{t-2}}$  and  $f(8) = -20$ .

4. (10 marks): Calculate the following indefinite integrals

$$(a) \int \frac{x^3}{\sqrt{16 - x^2}} dx \quad (b) \int \frac{3x^2 + 4x + 4}{x^3 + x} dx$$

5. (12 marks): Evaluate the following definite integrals (*do not approximate*):

$$(a) \int_0^{\pi} \cos^4 x \tan^2 x dx \quad (b) \int_1^e x^2 \ln x dx$$

6. (5 marks): Find the area of the region enclosed by the curves  $x = |y|$  and  $x = y^2 - 2$ .

**Bonus. (2 marks):** Given that

$$\int_0^{\pi} [f(x) + f''(x)] \sin x dx = 2$$

and  $f(\pi) = 1$ , find  $f(0)$ .