

**MAT 2322 A  
CALCULUS III  
MIDTERM  
October 11, 2012**

Instructor: Dr. Steve Desjardins

Duration: 80 minutes

Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

**Instructions:**

- Print your name and student number on this page.
- Verify that your copy of the exam has all 6 pages.
- There are 5 questions worth 4 marks each for a total of 20 marks.
- You must answer all questions.
- Write your answers in the spaces below the questions. You may use the backs of the pages if necessary.
- **No Notes or Books.**
- **Basic scientific calculators only - graphing and/or programmable calculators are NOT permitted.**

**Question 1.** (4 points) Find and classify the critical points of the function  
 $f(x, y) = x^3 + y^2 - 2xy$ .

**Question 2.** (4 points) Use Lagrange Multipliers to find the absolute maximum and minimum values of the function  $f(x, y) = (x + y)^2$  subject to the constraint  $x^2 + y^2 = 2$ .

**Question 3.** (4 points) Evaluate the following integral

$$\int_0^4 \int_{\sqrt{y}}^2 \frac{2}{1+x^3} dx dy .$$

**Question 4.** (4 points) Find the volume of the solid enclosed by the paraboloids  $z = 18 - x^2 - y^2$  and  $z = x^2 + y^2$ .

**Question 5.** (4 points) Find the volume of the tetrahedron bounded by the coordinate planes and the plane  $2x + 2y + z = 4$ .