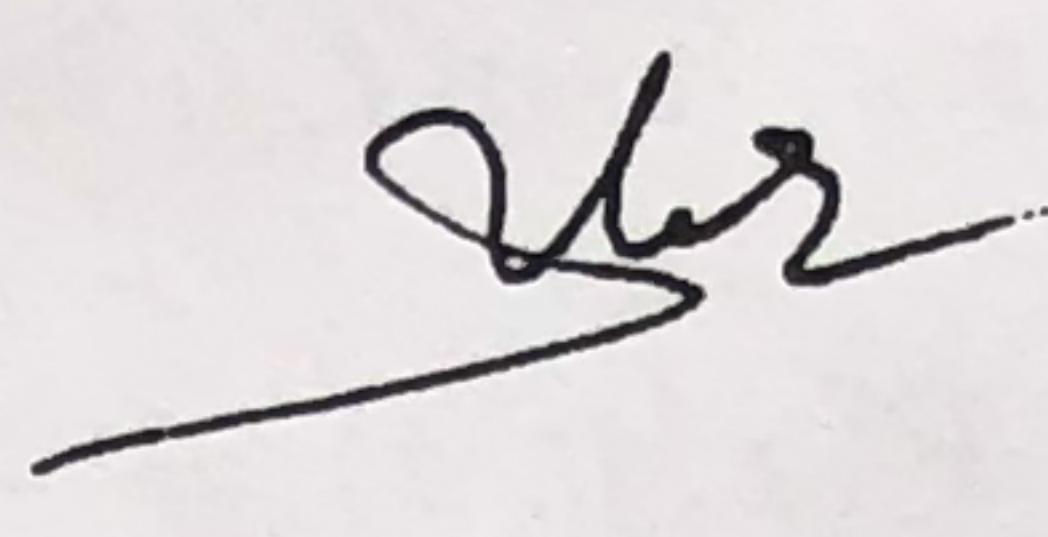
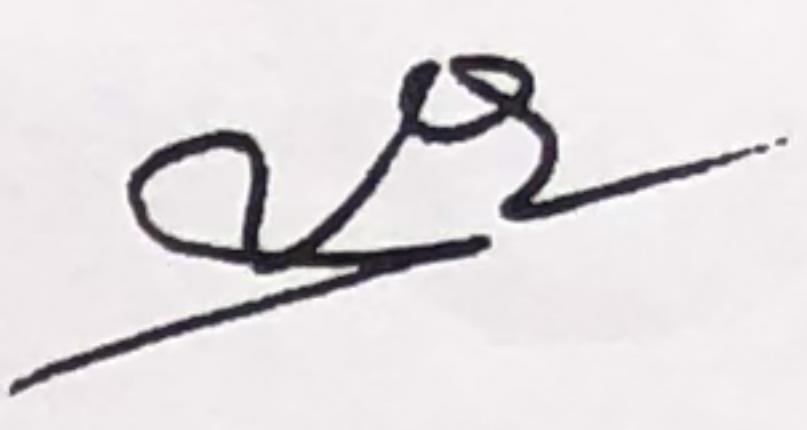


FINAL EXAMINATION  
Semester 2, Academic Year 2017-2018  
Duration: 120 minutes

<b>SUBJECT:</b> <b>Calculus 2</b>	
Chair of Department of Mathematics	Lecturers:
Signature: 	Signature: 
Trần Văn Linh	T.V. Linh, M.D. Thanh

- Each student is allowed a maximum of two double-sided sheets of reference material (of size A4 or similar) and a scientific calculator. All other documents and electronic devices are forbidden.
- Each question carries 20 marks.

**Question 1.**

a. Calculate the directional derivative of the function  $f(x, y) = x^2y^3$  in the direction of  $\mathbf{v} = \langle 1, 1 \rangle$  at the point  $P = (\frac{1}{6}, 3)$ .

b. Use the linear approximation of  $f(x, y) = e^{x^2+y}$  at  $(0, 0)$  to estimate  $f(0.01, -0.02)$ . Compare with the value obtained using a calculator.

**Question 2.**

Find the extreme values of the function  $f(x, y) = 2x+4y$  subject to the constraint  $x^2+y^2-5=0$  using the Lagrange multiplier method.

**Question 3.**

Find all the critical points (local max/min, saddle points) of the function

$$f(x, y) = y^2x - yx^2 + xy.$$

— PLEASE TURN OVER —

**Question 4.**

a) Evaluate the double integral

$$I = \iint_D 5x \, dA, \quad D = \{(x, y) \mid 0 \leq x \leq 1, 0 \leq y \leq x^3\}.$$

b) Find the volume of the solid under the surface  $z = 12(x + 1)y$  and above the region in the  $xy$ -plane bounded by the line  $y = 0$ ,  $x = 1$ , and  $y = \sqrt{x}$ .

**Question 5.**

a) Evaluate the line integral  $\int_C 2xy \, ds$ , where  $C : x = 3 \sin t, y = 3 \cos t, z = 4t, 0 \leq t \leq \pi/2$ .

b) Evaluate the surface integral  $\iint_S \mathbf{F} \cdot d\mathbf{S}$ , where  $\mathbf{F}(x, y, z) = -y\mathbf{i} - z\mathbf{j} - 6x^2\mathbf{k}$ , and  $S$  is the surface by  $z = 1 + 3x^2 + 2y, 0 \leq x \leq 1, 0 \leq y \leq 1$ .

—END OF QUESTIONS—