

Calculus and Analytical Geometry

Final

Code : <i>Math 119</i>			Last Name:			
Acad. Year : <i>2008-2009</i>			Name :		Student No:	
Semester : <i>Fall</i>			Department:		Section:	
Date : <i>14.1.2009</i>			Signature:			
Time : <i>9:00</i>			7 QUESTIONS ON 6 PAGES			
Duration : <i>160 minutes</i>			TOTAL 100 POINTS			
1	2	3	4	5	6	7

1. (5+5+5=15 points) Find the following limits, if they exist

(a) $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 5x + 3} - \sqrt{x^2 - x + 1})$.

(b) $\lim_{x \rightarrow 0^+} (2x)^{x/2}$.

(c) $\lim_{x \rightarrow 0} \frac{\int_0^{x^3} \sin(t^2) dt}{x^9}$.

2. (10 points) Find the maximal area of a rectangle such that two of its vertices lie on the x -axis, and the other two on the part of the parabola $y = 4x - x^2$ above the x -axis.

3. (15 points) Use the guidelines for sketching a curve to graph the function $y = (1 + x)e^{-x}$.

4. (10+10=20 points) (a) Compute the volume of the solid obtained by rotating the region in the first quadrant enclosed by the coordinate axes, the curve $y = e^x$, and the line $x = 1$, about the y -axis.

(b) Compute the volume of the solid obtained by rotating the region enclosed by $y = \frac{\sqrt{1+x^2}}{x(x+1)}$, $y = 0$, $x = 1$ and $x = \sqrt{3}$ about the line $x = -1$.

5. (6+6+6=18 points) Evaluate the following integrals

(a) $\int \frac{x+3}{2x^3-8x} dx.$

(b) $\int \frac{x}{\sqrt{3-2x-x^2}} dx.$

(c) $\int_1^{\infty} \frac{\ln x}{x^3} dx$

6. (6+6=12 points) Evaluate the following integrals

(a) $\int \frac{dx}{x^2\sqrt{x-4}}$.

(b) $\int \frac{x^7}{x^{12}-1} dx$. (Hint: let $u = x^4$.)

7. (10 points) Find the arclength of the curve

$$x = \frac{y^6 + 8}{16y^2}$$

from $y = 2$ to $y = 3$.