	Calculus and Analytical Geometry **Final**	
Code : *Math 119* Acad.Year: *2007-2008* Semester : *Fall* Date : *9.1.2008* Time : *9:00* Duration : *150 minutes*	Last Name: Name : Student No.: Department: Section: Signature:	
	6 QUESTIONS ON 6 PAGES TOTAL 103 POINTS	

1	2	3	4	5	6		

1. (5+5+5=15 points) Compute the following integrals

(a) $\displaystyle\int \frac{x^3+1}{x^2-x}\,dx$

(b) $\displaystyle\int \sin^4 x \cos^3 x\,dx$

(c) $\displaystyle\int_0^1 \frac{1}{2x-1}dx$

2. (7+7+7+7=28 points) Compute the following indefinite integrals

(a) $\int 3x^2 \sin x \, dx$

(b) $\int \frac{dx}{\sqrt{x} - \sqrt[3]{x}}$

(c) $\int \frac{x}{\sqrt{3 - 2x - x^2}} \, dx$

(d) $\int \sin 4x \cos 5x \, dx$

3. (10 points) Find the volume of the infinite solid obtained by rotating the area between $y = \dfrac{1}{x^3}$ and $y = 0$ for $x \geq 1$ around the $x-$axis.

4. (10 points) Find an approximation to the area of the region bounded by $y = 2^{-x^2}$, $y = 0$, $x = -\frac{1}{2}$, and $x = \frac{7}{2}$ using the Midpoint rule with $n = 4$.

5. (10+10=20pts.) Let $f(x) = e^{-x^2}$

(a) Graph the function f by finding its domain, asymptotes, local extremum(s), concavity and inflection points. **Note: For full credit, show all the necessary work to obtain the graph of** f.

(b) Suppose that a rectangle has its base on the x-axis and two vertices on the graph of the function $y = e^{-x^2}$. Show that the rectangle has maximum area when the two vertices are the points of inflection of the curve.

6. (5+5+5+5=20pts.) Compute the following:

(a) $\dfrac{d}{dx}\left[\ln\left(\sqrt[4]{\dfrac{x\tan x}{(x^2+1)\,e^x}}\right)\right]$

(b) $\dfrac{d}{dx}\left[\cos\left(\tan^{-1}\left(\sqrt{x}\right)\right)\right]$

(c) $\lim\limits_{x\to\infty}\left(\dfrac{2x+3}{2x+1}\right)^x$

(d) $\lim\limits_{x\to 0}\dfrac{e^x-1-x-\dfrac{x^2}{2}}{x^3}$