M E T U
Department of Mathematics

<table>
<tr><td colspan="2">Calculus with Analytic Geometry
Midterm II</td></tr>
<tr><td>Code : Math 119
Acad. Year : 2009-2010
Semester : Spring

Date : May 22nd 2010
Time : 13:30
Duration : 100 minutes</td><td>Last Name :
Name : Student No. :
Department : Section :
Signature :

7 QUESTIONS ON 4 PAGES
TOTAL 60 POINTS</td></tr>
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1	2	3	4	5	6	7		

SHOW DETAILED WORK IN EVERY PROBLEM.

Question 1. (12 pts.) Find the following limits.

(a) $\lim\limits_{x\to 5} \frac{\sqrt[3]{x}-\sqrt[3]{5}}{\sqrt{x}-\sqrt{5}}$

(b) $\lim\limits_{x\to 0} (\frac{1}{\arctan x} - \frac{1}{x})$

(c) $\lim\limits_{x\to\infty} x^{\frac{1}{x}}$

Question 2. (4 pts.) Let F(t) denote the amount of money in a bank after t years. Assume that the growth rate of F(t) is proportional to itself and the initial amount of the money is 1000 TL. If the increase in F(t) after one year is function F(t).

Question 3. (5 pts.) Find the area of region bounded by curves $y = \ln(x+2)$, $y = 2\ln x$ and $y = 0$.

Question 4. (9 pts.) Sketch the region R bounded by $2y = x^2$, $2x + 2y - 3 = 0$, and express the volume as an integral (do not evaluate the integral) for the solid

(a) obtained by revolving R around the line $y + 1 = 0$

(b) obtained by revolving R around the line $x = 2$, using the method of cylindrical shell.

Question 5. (12 pts.) (a) Prove that the function $f(x) = e^{2x+1} - 1$ is invertible. Find $f^{-1}(x)$ and its domain.

(b) Find the domain and range of function $g(x) = \arctan(3x + 2) + 1$ (recall that arctan is the inverse to the tangent function).

(c) Let F denote the inverse function for $2\sinh(x + 1)$. Find $F(0)$ and $F'(0)$.
(Recall that sinh is the hyperbolic sine function).

Question 6. (3 pts.) Calculate the integral $\int\limits_1^e \ln^2(x)\, dx$.

Question 7. (15 pts.) Find the following integrals

(a) $\int \frac{dx}{\sqrt{x}-\sqrt[4]{x}+1}$

(b) $\int \tan^3 x \sec x \, dx$

(c) $\int \frac{\sin^3 x}{\sqrt{\cos x}} dx$

(d) $\int \frac{6-5x}{x^3-5x^2+6x} dx$

(e) $\int \frac{dx}{\sqrt{2-(1+2x)^2}}$