Ministry Of Higher Education **Higher Institute of Engineering** **6th of October City** **Department of Basic Science**	مدينة الثقافة و العلوم	**Prep. Year: Final Exam** **Mathematics: (Calculus I)** **Course Code, BAS 11** **Date: January 2011**

الزمن: 3 ساعات — **الامتحان (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة** — Marks

[1]Find **y`** from the following: 12

(a) $y = 2x^3 + \cos x$ (b) $y = 3^x.\tan x$ (c) $y = \ln x + \log(x^2+1)$

(d) $y = \sinh^{-1}x + \tan^{-1}x$ (e) $y = \dfrac{\sin x}{x + \sinh x}$ (f) $x^2 + y + 2^x + 3^y = 0$

[2](a)Write the membership table of the statement: $S = (A - B`) \cup (B - C)$ 4

(b)Evaluate the following limits: 8

(i) $\lim\limits_{x\to 0} \dfrac{x - \sin x}{e^x - e^{-x}}$ (ii) $\lim\limits_{x\to 1} \dfrac{\sqrt[3]{x} - 1}{\sqrt[4]{x} - 1}$ (iii) $\lim\limits_{x\to 0} \dfrac{\tan 2x}{x^3 + 4x}$ (iv) $\lim\limits_{x\to 1} \dfrac{x-1}{\ln x}$

[3](a) Sketch the curve of the function $f(x) = x^3 - 3x$ 4

(b) Find the area of the region between the curve $y = \sin x$, x- axis, $x \in [0, 2\pi]$ 4

(c) Using trapezoidal rule, compute the integral $\int_1^2 \dfrac{\log x}{x+2} dx$, $n = 5$ 4

[4](a) Sketch the curve of the function $f(x) = \dfrac{4}{x} + x$ 4

(b) Find the following integrals: 8

(i) $\int (3 + x^2 + 2^x)\, dx$ (ii) $\int (x + \dfrac{1}{x} + \dfrac{1}{x^2}) dx$ (iii) $\int x.3^x\, dx$ (iv) $\int \dfrac{x}{x^2 - 2x + 1}\, dx$

[5](a)Compute the length of the curve given by $y = 4 + \dfrac{2}{3}x^{3/2}$, $x \in [1, 2]$ 3

(b)If the region between the curve $y = \cos^2 x$, x-axis, $x \in [0, \pi/2]$ is rotated about x-axis. Find the volume of the generated solid. 3

(c) Find the following integrals: 6

(i) $\int_{-1}^{1} \dfrac{x^3}{\sqrt{2 - x^2}} dx$ (ii) $\int_0^{\pi/2} \dfrac{1}{4 + 5\sin x}\, dx$

Good Luck *Dr. Mohamed Eid*