

# DA MON COLLEGE

## DEPARTMENT OF MATHEMATICS

Final Examination

CALCULUS - I

Final 2012

Time: 3 hours

Examiners: K. Ameer, L. Frajberg, G. Honnouvo, M. Ishii, T. Kengatharam, S. Shahabi, O. Zlotcheveskaia

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Name: \_\_\_\_\_  
ID: \_\_\_\_\_

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Instructions:

- Translation and regular dictionaries are permitted.
- Scientific non-programmable calculators are permitted.
- Print your name and ID in the provided space.
- This examination booklet must be returned intact.

The examination is for 140 minutes. The examination is closed book.  
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(1) [4+4+4 marks] Evaluate the following limits without using L'ôpital rule. Give exact answers (no decimals).

(a)  $\lim_{x \rightarrow 2} x^3 - 8$

- (e) Find the intervals on which the function  $f$  is concave down and concave up, and state the inflection points (if any)
- (f) Draw the graph of  $f$  indicating all the data collected about  $f$  from the above parts.
- (12) [4 marks] If  $\frac{dN}{dt} = kN$ , where  $k$  is a constant, and when  $t = 0$ ,  $N = 250$  and when  $t = 1$ ,  $N = 400$ . What is the value of  $N$  when  $t = 4$ .
- (13) [4 marks] Solve the following differential equation  $\frac{dy}{dx} = \frac{\cos x}{1 + x^2}$  with the initial condition  $y(0) = 1$ .
- (14) [4+4 marks] Evaluate the integrals

$$(a) \int \frac{x}{(x^2 + 1)^2} dx \quad (b) \int \sin x \sec^2(\cos x) dx .$$