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CALC ᵘLᵘ -I

F⫴ 2012   ⫯ ꝑ: 3ᶠ•⫰

⫯   ⫰ • :K. Ameur, L. Frajberg, G. Honnouvo, M. Ishii, T. Kengatharam, S. Shahabi, O. Zlotcheveskaia

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    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.

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(1) *[4+4+4 marks]*Evaluate the following limits without using L'ôpital rule. Give exact answers (no decimals).

(a) $\lim\limits_{x \to 2} \dfrac{x^3 - 8}{\ }$

(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 $\dfrac{dN}{dt} = kN$, 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 $\dfrac{dy}{dx} = \dfrac{y \cos x}{1 + y^2}$ with the initial condition $y(0) = 1$.

(14) [*4+4 marks*]Evaluate the integrals

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