KUWAIT UNIVERSITY

DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE

Math 102 — March 28, 2002

Calculus II — First MidTerm Exam — Duration: 75 mins

Use of calculators, cellular phones or pagers is NOT allowed during this examination.

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1. Let $f(x) = \ln(\frac{\pi}{4} - \tan^{-1} x)$. [2 x 3 pts]

   a. Find the domain of $f(x)$, and show that it has an inverse.

   b. Find $f^{-1}(x)$ and its domain.

2. Prove that $\dfrac{d}{dx}\sec^{-1} x = \dfrac{1}{x\sqrt{x^2-1}}$ [2 pts]

3. Find y' if y is defined by the formula: [3 pts]

$$2^y = 8^{\sin^{-1} x} \sinh 2^x$$

4. Calculate $\cos\left(2\tan^{-1}(\frac{2}{3}) - \frac{\pi}{2}\right)$. [2 pts]

5. Evaluate $\lim\limits_{x\to\infty} e^{\ln x - x^2}$ [3 pts]

6. Evaluate the following integrals: [3 x 3 pts]

   a. $\displaystyle\int \frac{1}{\sqrt{e^{2x}-9}}\,dx$

   b. $\displaystyle\int \frac{\cot x}{2+\ln(\sin^3 x)}\,dx$

   c. $\displaystyle\int \frac{\cosh x}{4\cosh^2 x - 3\sinh^2 x}\,dx$