Kuwait University · Math 102 Date: Dec 28, 2003
Dept. of Maths. & Comp. Sci. Second Midterm Duration: 90 minutes

Answer all of the questions. **Calculators, pagers and mobile telephones are NOT allowed.**

1. (4 pts) Find the following limits.

$$(a)\ \lim_{x\to\infty}(1+e^{-x})^{\exp(x)} \qquad (b)\ \lim_{x\to 1}\left(\frac{1}{1-x}-\frac{1}{\ln x}\right)$$

2. (12 pts) Evaluate the following integrals.

(a) $\displaystyle\int \frac{x^3+1}{(x^2+1)^2}\,dx$

(b) $\displaystyle\int e^x \sin 2x\,dx$

(c) $\displaystyle\int \sin^5 x\cos^2 x\,dx$

(d) $\displaystyle\int \sqrt{1+\sqrt{x}}\,dx$

3. (4 pts) Determine whether the improper integral converges or diverges; if i converges, find its value.

$$\int_1^2 \frac{dx}{\sqrt{-x^2+4x-3}}.$$

4. (5 pts) Let C be the curve given by the parametric equations

$$x = 1+\sin^{-1} t \qquad y = 1-\cos^{-1} t, \qquad 0\le t\le 1.$$

(a) Find the length of C.

(b) Find the equation of the tangent line at the point corresponding to $t=0$.

(c) Find $\dfrac{d^2y}{dx^2}$