Kuwait University Department of Mathematics and Computer Science Second Mid Term Exam July 22nd, 2004 Duration: 75 minutes Math 102 (Calculus II) All mobile communication equipments and calculators are not allowed 1) Evaluate the following integrals (3 points) a) $\int (\ln x)^2 dx$ b) $\cos^3 x \sqrt{\csc x} dx$ مام فاق c) $\int \frac{x^2 + 2x + 3}{x^4 - 1} dx$ d) $\int \frac{1}{1-\sin x-\cos x} dx$ المام فاق e) $\int \sqrt{-x^2 + 4x + 5} \, dx$ 2) Determine whether the following integral converges or diverges. If the integral. converges, find its value. (3 points) $\int_{1}^{\infty} \frac{1}{x (1 + \ln x)^{2}} dx$ 3) Let C be the curve whose parametric equations are given as follows: $x = \ln(\sec t)$ and $y = \tan t - t$, $0 \le t \le \frac{\pi}{4}$. a) Find the equation of the tangent line at $t = \frac{\pi}{4}$ on C. (2 points) b) Find $\frac{d^2y}{dx^2}$. (2 points) c) Determine the arc length of C. (3points)