MAC 2313 Quiz 3

NAME: _____

Thursday, 10/3/2019

Problem 1. (5 pts) Evaluate the integral

$$\int_0^1 \left(\frac{1}{t+1}\mathbf{i} + \frac{1}{t^2+1}\mathbf{j} + \frac{t}{t^2+1}\mathbf{k} \right) dt$$

Problem 2. (5 pts) Find the arc length function for the curve measured from the point P in the direction of increasing t.

$$\mathbf{r}(t) = \langle e^t \sin t, e^t \cos t, \sqrt{2e^t} \rangle, \quad P(0, 1, \sqrt{2})$$

Problem 3. (Bonus, 5 pts)If a plane curve has the parametric equations $x = f(t), y = g(t)$, show that the curvature of the curve is

$$\kappa = \frac{|\dot{x}\ddot{y} - \ddot{x}\dot{y}|}{[\dot{x}^2 + \dot{y}^2]^{3/2}}$$

where the dots indicate the derivatives with respect to t. *Hint: Use the formula* $\kappa = |\mathbf{r}' \times \mathbf{r}''|/|\mathbf{r}'|^3$.