

8) Suppose  $C_1$  is the top half of the unit circle and  $C_2$  is the bottom half of the unit circle, and they are parameterized so that  $C_1$  starts at  $\{1, 0\}$  and  $C_2$  starts at  $\{-1, 0\}$ . If

$$\{m[x,y], n[x,y]\} = \{y^5, 5xy^4\},$$

what do we know about the path integrals

$$\int_{C_1} m[x, y] dx + n[x, y] dy$$

and

$$\int_{C_2} m[x, y] dx + n[x, y] dy?$$

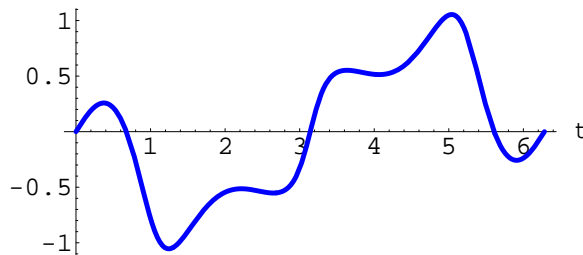
9) What is the gradient field of the function

$$f[x, y] = \ln(xy)?$$

Does  $f[x,y]$  have any local minima or maxima?

- 10) a) What relationship is there between a trajectory in a vector field and the vectors themselves?  
b) Can two trajectories of a vector field ever cross each other? Why or why not?

11) Given a vector field  $\text{Field}[x, y]$  and  $\text{unittan}[t]$ , the unit tangent function of the closed curve  $\{x[t], y[t]\}$ , the following plot is of  $\text{Field}[x[t], y[t]] \cdot \text{unittan}[t]$  for  $t$  from 0 to  $2\pi$ .



Interpret this plot. (If you're curious, the zeroes are at 0,  $\pi/4$ ,  $\pi$ ,  $7\pi/4$ , and  $2\pi$ .)