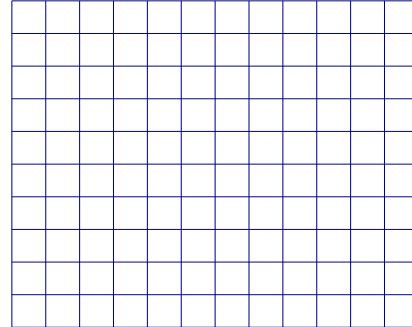Math 001D Assignment 16.1   Ans_____

Instructions: Write complete legible solutions to the following problems in the space provided. Be sure to supply all the necessary steps that lead to your answers

1. Sketch the vector field $F(x,y) = \dfrac{\langle y, -x \rangle}{\sqrt{x^2 + y^2}}$
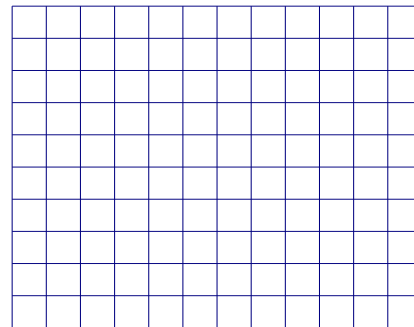
2. A particle moves in a velocity field $\mathbf{v}(x,y) = \langle x^2, x + y^2 \rangle$. If it is at position (2, 1) at time t = 3, estimate its location at time t = 3.01.

    Ans_____

3. Find the gradient vector then sketch it

    $F(x, y) = \sqrt{x^2 + y^2}$

4.a   Sketch the vector field $\mathbf{F}(x, y) = \mathbf{i} + x\mathbf{j}$, and then sketch some flow lines. What shape do these flow lines appear to have?

4.b   If parametric equations of the flow lines are $x = x(t)$, $y = y(t)$, what differential

equations do these functions satisfy? Deduce that $\dfrac{dy}{dx} = x$.

4.c   If a particle starts at the origin in the velocity field given by $\mathbf{F}$, find an equation of the path it follows.

5.   Find an arc length parametric representation of the give curve where the arc is measured from the point at $t = 0$ in an increasing direction of t.
$$\mathbf{r}(t) = 2\mathbf{i} + (1 - 3t)\mathbf{j} + 4t\mathbf{k}$$