1. Find the gradient vector field ∇f of f and sketch it where $f(x, y) = xy - 2x$

Evaluate the line integral where C is the given curve

2. $\int_C y ds$, C: $x = t^2$, $y = t$, $0 \leq t \leq 2$
3. $\int_C xydx + (x - y)dy$, C is the line segments from (0,0) to (2,0) and from (2,0) to (3,2)

4. Determine whether $F = (ye^x + \sin y)\mathbf{i} + (e^x + x\cos y)\mathbf{j}$ is a conservative vector field. If it is, find a function f such that $F = \nabla f$.
5. $F(x, y) = x^3 + y^4\mathbf{i} + x^4 + y^3\mathbf{j}$
   C: $r(t) = \sqrt{t}\mathbf{i} + (1 + t^3)\mathbf{j}$ $0 \leq t \leq 1$
   (a) Find a function f such that $F = \nabla f$
   (b) Use (a) to evaluate $\int_C F \cdot dr$.
6. Find the work done by the force field F moving an object from P to Q where
   $F(x, y) = 2y^{3/2}\mathbf{i} + 3x\sqrt{y}\mathbf{j}$; P(0,1), Q(2,0).

Answers:

1.
2. $\frac{1}{12}(17\sqrt{17}-1)$
3. $\frac{17}{5}$
4. $ye^x + x\sin y + K$
5. $\frac{1}{4}x^4y^4$
6. 30