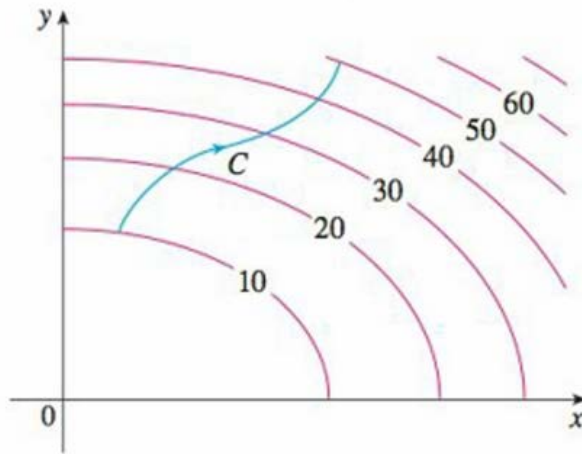


- I. The figure shows a curve C and a contour map of a function f whose gradient is continuous. Find $\int_C \nabla f \cdot d\mathbf{r}$.

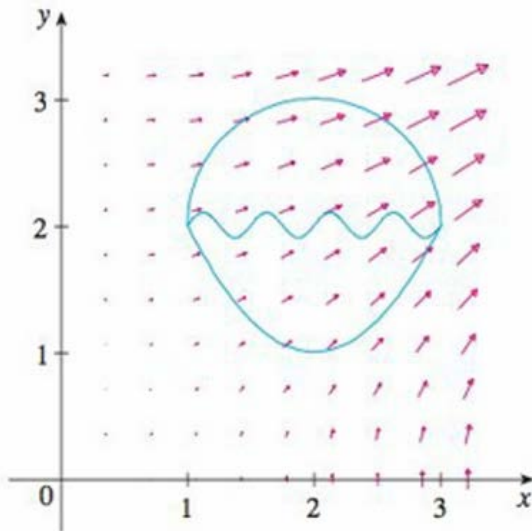


- 3–10 Determine whether or not \mathbf{F} is a conservative vector field. If it is, find a function f such that $\mathbf{F} = \nabla f$.

7. $\mathbf{F}(x, y) = (ye^x + \sin y)\mathbf{i} + (e^x + x \cos y)\mathbf{j}$

11. The figure shows the vector field $\mathbf{F}(x, y) = \langle 2xy, x^2 \rangle$ and three curves that start at $(1, 2)$ and end at $(3, 2)$.

- (a) Explain why $\int_C \mathbf{F} \cdot d\mathbf{r}$ has the same value for all three curves.
 (b) What is this common value?



- 12–18 (a) Find a function f such that $\mathbf{F} = \nabla f$ and (b) use part (a) to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ along the given curve C .

12. $\mathbf{F}(x, y) = x^2\mathbf{i} + y^2\mathbf{j}$,

C is the arc of the parabola $y = 2x^2$ from $(-1, 2)$ to $(2, 8)$

13. $\mathbf{F}(x, y) = xy^2\mathbf{i} + x^2y\mathbf{j}$,

$C: \mathbf{r}(t) = \langle t + \sin \frac{1}{2}\pi t, t + \cos \frac{1}{2}\pi t \rangle, 0 \leq t \leq 1$

- 19–20 Show that the line integral is independent of path and evaluate the integral.

19. $\int_C \tan y \, dx + x \sec^2 y \, dy$,

C is any path from $(1, 0)$ to $(2, \pi/4)$

- 21–22 Find the work done by the force field \mathbf{F} in moving an object from P to Q .

21. $\mathbf{F}(x, y) = 2y^{3/2}\mathbf{i} + 3x\sqrt{y}\mathbf{j}; P(1, 1), Q(2, 4)$