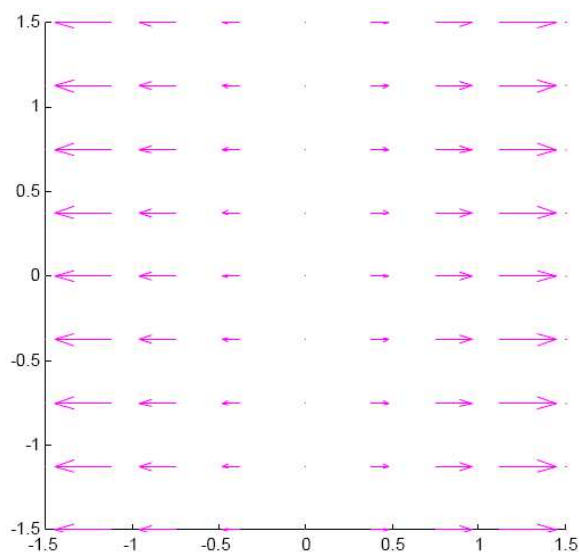


Classroom Voting Questions: Multivariable Calculus

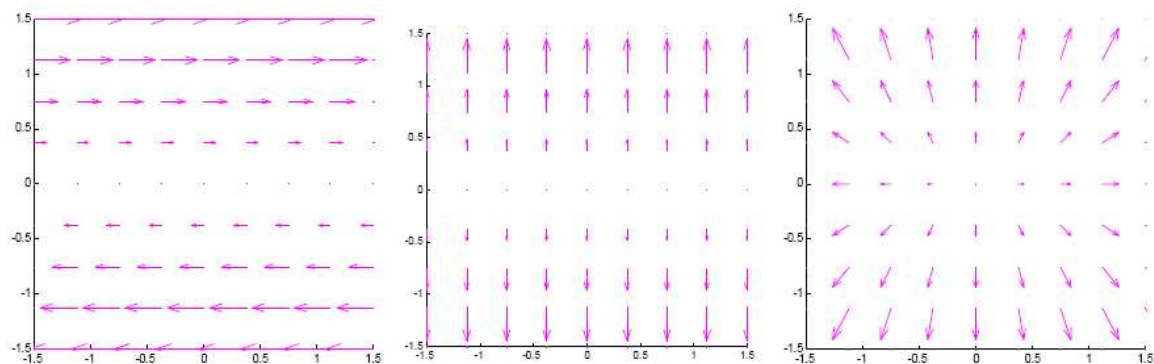
18.3 Gradient Fields and Path-Independent Fields

1. The vector field shown is the gradient vector field of $f(x, y)$. Which of the following are equal to $f(1, 1)$?



- (a) $f(1, -1)$
- (b) $f(-1, 1)$
- (c) both of the above
- (d) none of the above

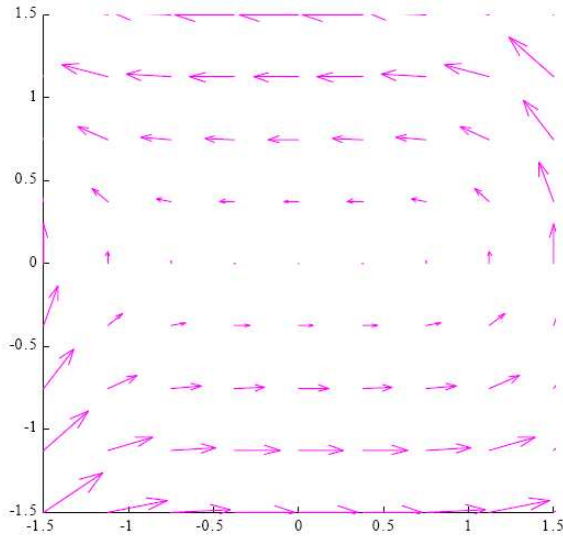
2. Which of the vector fields below is not path independent?



- (a) the one on the left

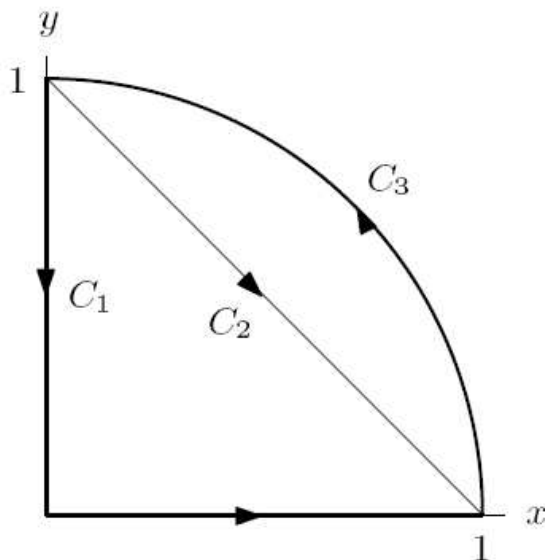
- (b) the one in the middle
- (c) the one on the right

3. Which of the following explains why this vector field is not a gradient vector field?



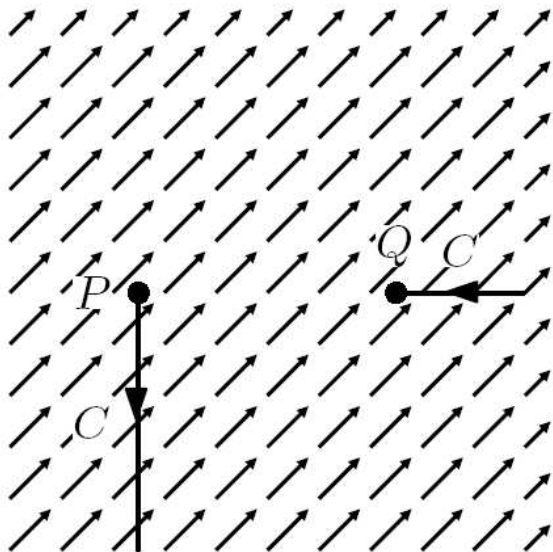
- (a) The line integral from $(-1,1)$ to $(1,1)$ is negative.
- (b) The circulation around a circle centered at the origin is zero.
- (c) The circulation around a circle centered at the origin is not zero.
- (d) None of the above.

4. The line integral of $\vec{F} = \nabla f$ along one of the paths shown below is different from the integral along the other two. Which is the odd one out?

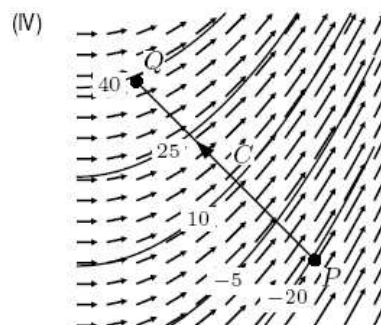
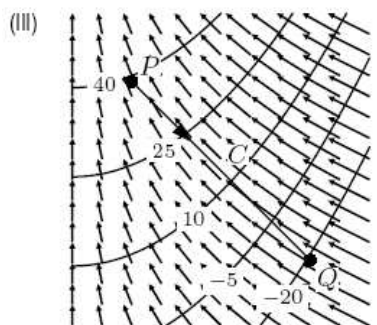
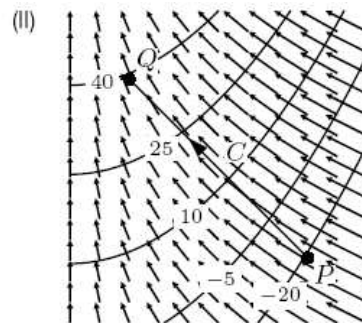
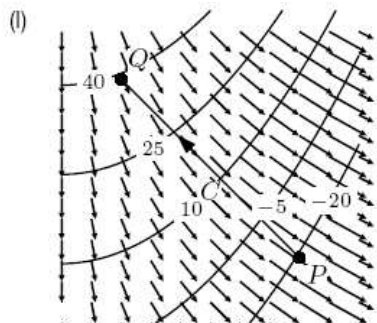


- (a) C_1
- (b) C_2
- (c) C_3

5. The figure below shows the vector field ∇f , where f is continuously differentiable in the whole plane. The two ends of an oriented curve C from P to Q are shown, but the middle portion of the path is outside the viewing window. The line integral $\int_C \nabla f \cdot d\vec{r}$ is



- (a) Positive
 - (b) Negative
 - (c) Zero
 - (d) Can't tell without further information
6. Which of the diagrams contain all three of the following: a contour diagram of a function f , the vector field ∇f of the same function, and an oriented path C from P to Q with $\int_C \nabla F \cdot d\vec{r} = 60$?



- (a) I
- (b) II
- (c) III
- (d) IV

7. If f is a smooth function of two variables that is positive everywhere and $\vec{F} = \nabla f$, which of the following can you conclude about $\int_C \vec{F} \cdot d\vec{r}$?

- (a) It is positive for all smooth paths C .
- (b) It is zero for all smooth paths C .
- (c) It is positive for all closed smooth paths C .
- (d) It is zero for all closed smooth paths C .