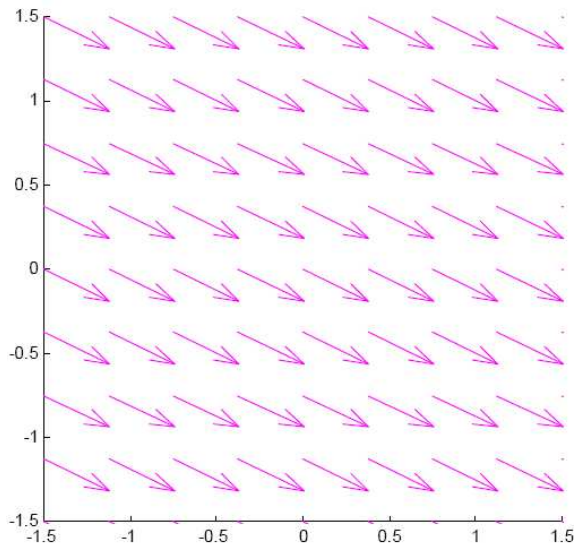# Classroom Voting Questions: Multivariable Calculus

18.1 The Idea of a Line Integral

1. Suppose C is the path consisting of a straight line from (-1,0) to (1,0) followed by a straight line from (1,0) to (1,1). The line integral along this path is

   (a) positive.

   (b) zero.

   (c) negative.

2. Given three curves, C_1 (a straight line from (0,0) to (1,1)), C_2 (a straight line from (1,-1) to (1,1)), and C_3 (the portion of the circle of radius $\sqrt{2}$ centered at the origin moving from (1,-1) to (1,1)), rank the curves according to the value of the line integral of $\vec{F} = -y\hat{i} + x\hat{j}$ on each curve.

   (a) $C_1 < C_2 < C_3$

   (b) $C_2 < C_1 < C_3$

   (c) $C_3 < C_1 < C_2$

3. The vector field $\vec{F}$ and several curves are shown below. For which of the paths is the line integral positive?
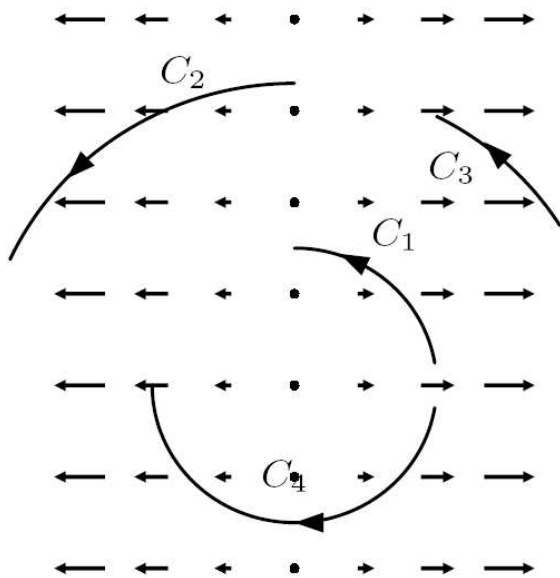
(a) C_1

(b) C_2

(c) C_3

(d) C_4

4. If the path C is a circle centered at the origin, oriented clockwise, which of the vector fields below has a positive circulation?
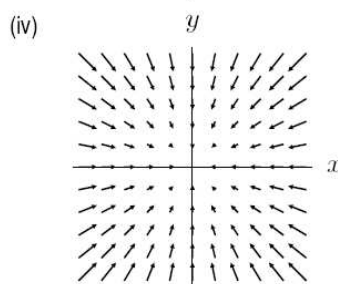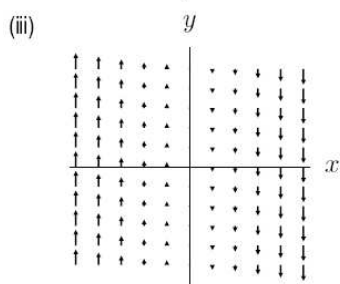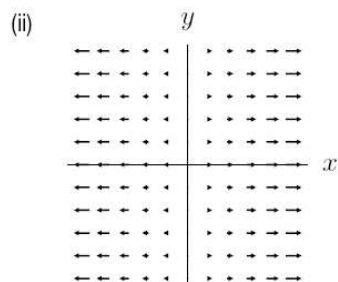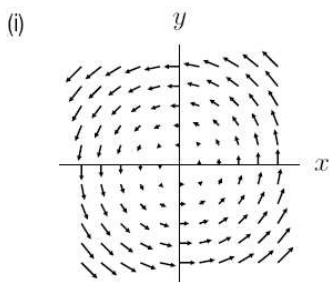
(a) i

(b) ii

(c) iii

(d) iv

5. True or false? Given two circles centered at the origin, oriented counterclockwise, and any vector field $\vec{F}$, then the path integral of $\vec{F}$ is larger around the circle with larger radius.

   (a) True, and I am very confident

   (b) True, but I am not very confident

   (c) False, but I am not very confident

   (d) False, and I am very confident

6. True or false? If $\vec{F}$ is any vector field and C is a circle, then the integral of $\vec{F}$ around C traversed clockwise is the negative of the integral of $\vec{F}$ around C traversed counterclockwise.

   (a) True, and I am very confident

   (b) True, but I am not very confident

   (c) False, but I am not very confident

   (d) False, and I am very confident

7. The work done by the force field $\vec{F} = y\hat{i}$ as an object moves along a straight line joining (1, 1) to (1,-1) is

   (a) positive

   (b) negative

   (c) zero

8. How much work does it take to move in a straight line from coordinates (1,3) to (5,3) in the vector field $\vec{F} = -4\hat{i} + 3\hat{j}$? Assume that coordinates are in meters and force is in Newtons.

   (a) -25 Joules

   (b) -16 Joules

   (c) 7 Joules

   (d) 16 Joules

   (e) 25 Joules