MATH 203 Calculus III
Homework 21

Basic Information
This assignment is due on Gradescope by **1:30 PM on Friday, May 2**.

Make sure you understand MHC honor code and have carefully read and understood the additional information on the class syllabus. I am happy to discuss any questions or concerns you have!

Since this is a 200-level mathematics course, quite a few homework questions will ask you to explain your reasoning or process for solving a problem. Whenever possible, write your explanations in complete sentences and write your answers as if you were explaining to a peer in the class.

The homework problems will be graded anonymously so please do not put your name or other identifying information on the pages.

Turn In Problems
14.3: 14, 18, 20

#4 (a) Find a function f such that $\vec{F} = \nabla_f$ when $\vec{F}(x, y) = \langle yz, xz, xy + 2z \rangle$.

(b) Use (a) to evaluate $\int_C \vec{F} \bullet d\vec{r}$ where C is the line segment from $(1,\ 0,\ -2)$ to $(4,\ 6,\ 3)$.

#5. On the last page are plots of 4 vector fields. Match those with the vector fields listed below:

(a) $\vec{F}(x, y) = \langle 1,2,3 \rangle$
(b) $\vec{F}(x, y) = \langle 1,2,z \rangle$
(c) $\vec{F}(x, y) = \langle x, y,3 \rangle$
(d) $\vec{F}(x, y) = \langle x, y, z \rangle$

#6[1] Let $\vec{F}$ be the vector field shown in Figure A on the next page.

(a) If C_1 is the vertical line segment from $(-3,\ -3)$ to $(-3,\ 3)$ determine whether $\int_{C_1} \vec{F} \bullet d\vec{r}$ is positive, negative, or zero. Explain your answer.

[1] Problem #5, #6, and #7 and last Additional Problem from James Stewart's Calculus: Early Transcendentals 6th edition.

(b) If C_2 is the counterclockwise-oriented circle with radius 3 and center the origin, determine whether $\int_{C_2} \vec{F} \bullet d\vec{r}$ is positive, negative, or zero. Explain your answer.

#7 Figure B on this page shows the vector field $\vec{F}(x, y) = \langle 2xy, x^2 \rangle$ and three curves that start at $(1, 2)$ and end at $(3, 2)$.

(a) Explain why $\int_C \vec{F} \bullet d\vec{r}$ has the same value for all three curves.

(b) What is this common value?

Additional Problems (to do on your own, not to turn in)

14.3: 15, 17, 19

Figure C on this page shows a vector field $\vec{F}$ and two curves C_1 and C_2, Are the line integrals of $\vec{F}$ over C_1 and C_2 positive, negative, or zero? Explain.

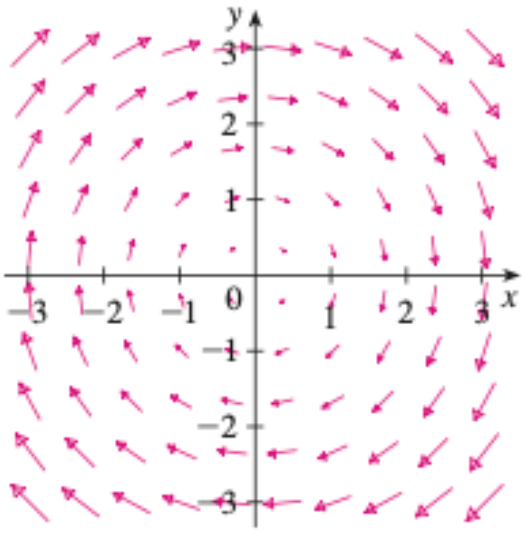


Figure A

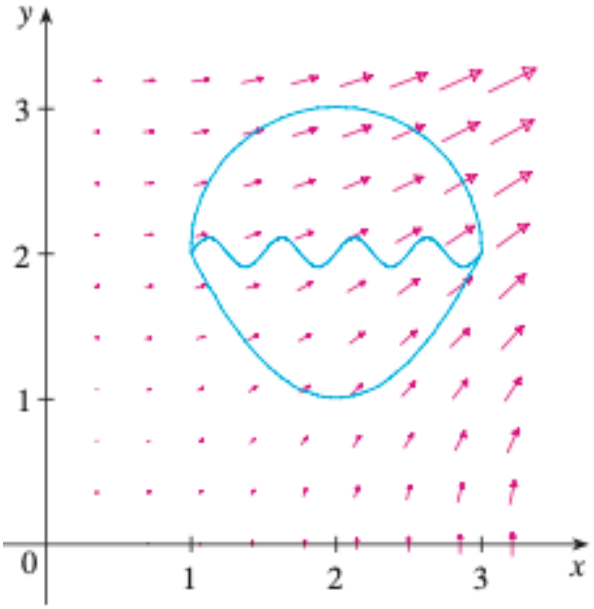


Figure B

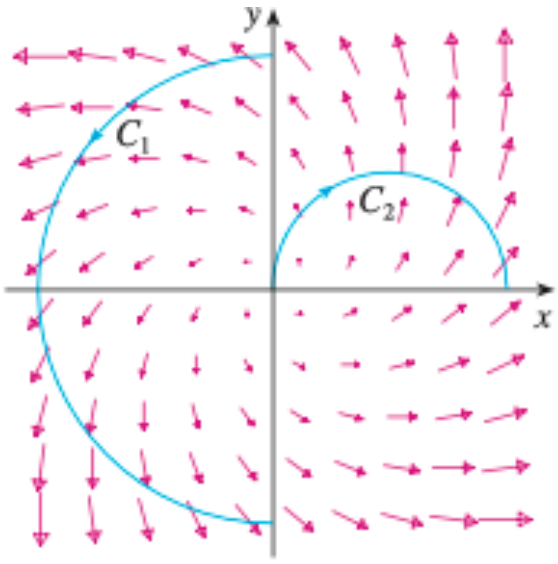
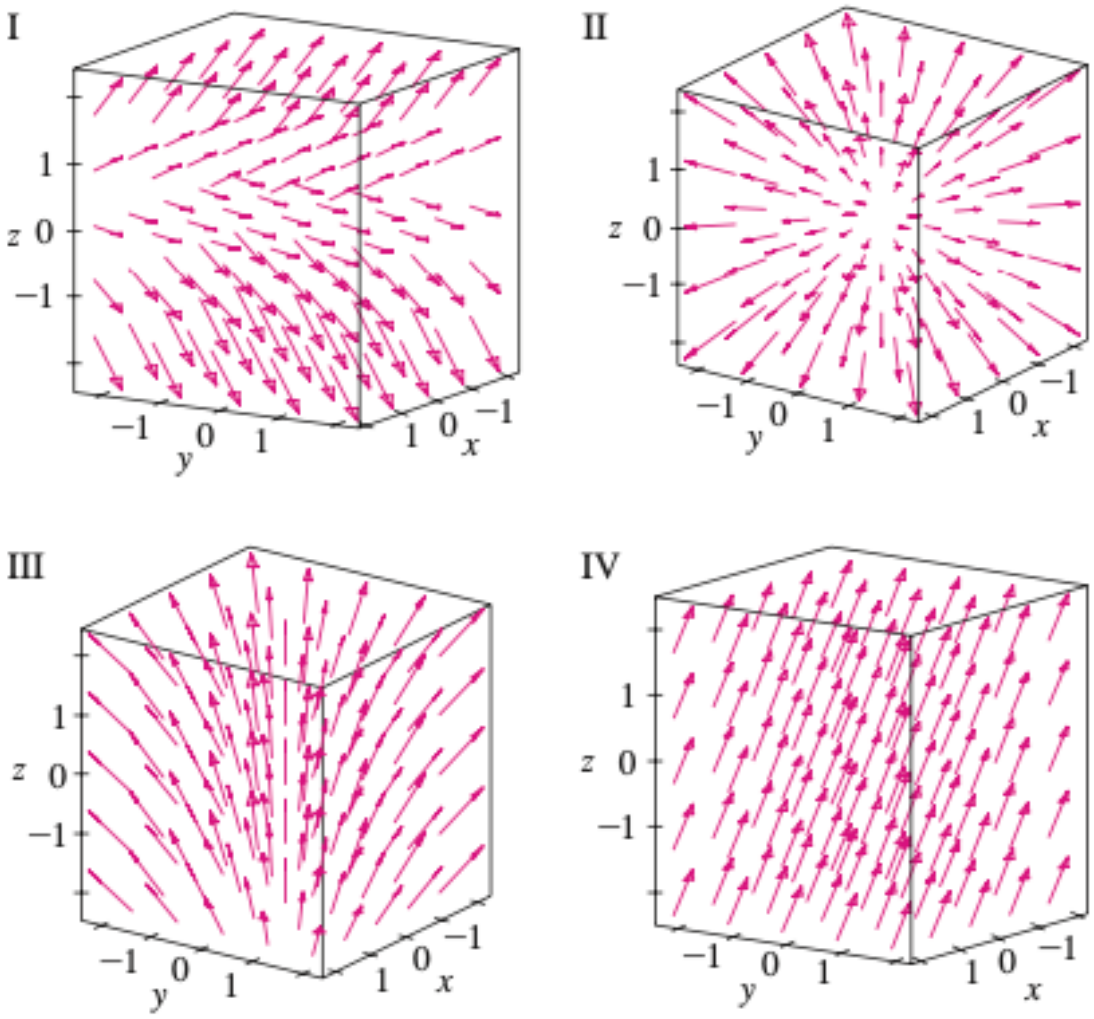


Figure C


I
II
III
IV
z
y
x
1
0
−1