

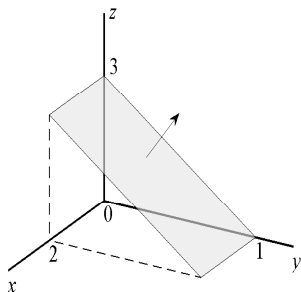
Instructions:

- (1) Do not cheat. Cheating in any form can and will result in expulsion from the University.
 - (2) Without supporting work no partial credits will be given.
 - (3) Do not use pencils. Use ballpoint pens or ink pens.
 - (4) Use a printer to print out the exam to work on, or match up exactly the layout of the exam if you choose to create the layout manually.
 - (5) If you choose to create the layout manually, do the following: (1) Use EXACT one page per problem, including its multiple parts, if any. That is, if a problem has (a), (b), ... parts, then all parts must be included in one page. (2) Write your name and NUID on the top of each page. (3) Do not copy any part of the problem to save time, but label and arrange your solution according to its parts if the problem has multiple parts. (4) Arrange all pages in the same numerical order as for the problems. Misplaced work may not get credited.
 - (6) Include all problems in one PDF file, orientation portrait, one problem per page, in the same numerical order as the problem numbers, excluding this instruction page. Work misplaced maybe work not credited by Gradescope's grading program.
 - (7) Submit this one PDF file to your recitation section on Gradescope. Do not include this Instruction page in your submission. Write "Meow" for Bonus Question answer to double the bonus point.
 - (8) No work will be accepted after the submission deadline by Gradescope.
 - (9) Audio and video must be on on Zoom. You must be present in your live streaming. Ask permission by Zoom chat to be excused.
 - (10) You must be alone in a quiet room, or at least 12 feet away from another person. No two students taking the exam are allowed to use the same room, or within 12 feet of each other.
 - (11) Exam questions are not allowed to be shared with anyone or in any way, in part or in whole or in paraphrase. This means no communication systems are allowed during exam except for Zoom chat with exam proctor and exam submission to Gradescope.
 - (12) Textbook, lecture notes and lecture videos from Canvas, exercises and homework solutions, calculators, personal notes are allowed. Any other study aids must be requested for clearance, in advance.
 - (13) **Departmental Policy on Follow-Up Assessment:** If the instructor has any reason to believe that a student may have used unsanctioned resources on any assignment, they reserve the right to meet with the student via Zoom and ask that the student clearly explain their work and reasoning on any problem. This includes, but is not limited to, an instructor suspecting that a student used an online answer service resource, or collaborated with another individual during exams.
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Print Your Name Legibly: _____ NUID: _____

1(15pts) (a) Find a parameterized equation for the right half of the circle, $x^2 + y^2 = 4$, from $(0, -2)$ to $(0, 2)$.

(b) Find the flux of the vector field $\vec{F} = \vec{i} + \vec{j} + \vec{k}$ through the rectangle as shown.



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2(15pts) Find the line integral of the vector field $\vec{F}(x, y, z) = 2\vec{j} + z\vec{k}$ along the helix:
 $x = \cos(2\pi t)$, $y = 2t$, $z = \sin(2\pi t)$ from point $(1, 0, 0)$ to $(1, 2, 0)$.

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3(20pts) Let $\vec{F}(x, y, z) = \vec{i} + \vec{j} + \vec{k}$ and S be the conical surface $z = \sqrt{x^2 + y^2}$, $0 \leq z \leq 4$.

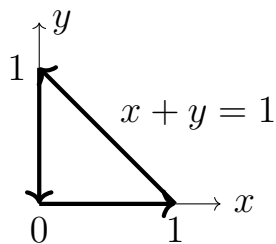
(a) Find a parameterization of S that is **NOT** the natural parameterization: $\vec{r} = \langle x, y, f(x, y) \rangle$ and $x^2 + y^2 \leq 4$.

(b) Find the flux of \vec{F} through S if S is oriented upward. Use any parameterization of S or $-S$.

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4(15pts) Use Green's Theorem to find the circulation of the vector field $\vec{F}(x, y) = \langle e^{x^2} - 2y, x^2 \rangle$ around the triangle with vertexes $(0, 0)$, $(1, 0)$, $(0, 1)$.



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5(20pts) (a) Use the curl test to show this vector field $\vec{F} = \langle 2xy + 1, x^2 + 2, 1 \rangle$ is conservative.

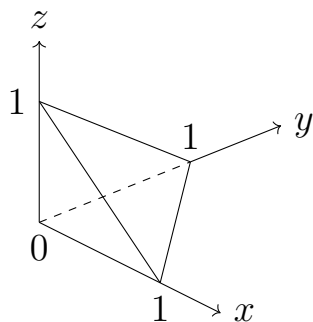
(b) Find a potential function f for \vec{F} .

(c) Find the value of the line integral of the vector field from $(1, 0, 0)$ to $(1, 2, 0)$ along the same helix of Problem #2.

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6(15pts) Find the flux of the vector field $\vec{F}(x, y, z) = (x + y)\vec{i} + (y + z)\vec{j} + (z + x)\vec{k}$ through the surface of the solid bounded by these planes $x = 0$, $y = 0$, $z = 0$, and $x + y + z = 1$, oriented outward.



Bonus Question (2pts): The State Mammal of Nebraska is: _____