Final Review Problems   Math 20E, Lecture A00, Spring 2019

Name: PID:

- Print your *NAME* on every page and write your PID in the space provided above.

- Show all of your work in the spaces provided. No credit will be given for unsupported answers, even if correct.

- Supporting work for a problem must be on the page containing that problem. No scratch paper will be accepted.

- No calculators, tables, phones, or other electronic devices are allowed during this exam. You may use your double-sided handwritten notes, but no books or other assistance.

DO NOT TURN PAGE UNTIL INSTRUCTED TO DO SO
(This exam is worth 40 points)

Problem 0.(1 points.) Follows the instructions on this exam and any additional instructions given during the exam.

Problem 1. Find the line integral $\int_C \vec{F} \cdot d\vec{s}$ of the vector field $\vec{F}(x,y,z) = (3x^2z, z^2, x^3 + 2yz)$ along the curve C parametrized by $\vec{c}(t) = (\ln t/\ln 2, t^{3/2}, t\cos(\pi t))$ for $1 \leq t \leq 2$.

Problem 2. Let $\vec{F} = \frac{1}{3}x^3z\vec{i} + (x+z)\vec{j} + \frac{1}{2}y^2z^2\vec{k}$. Find the flux of $\vec{F}$ *inward* across the surface S that consists of the portion of the cone $z = \sqrt{x^2+y^2}$ for $1 \leq z \leq 2$ together with its caps $x^2 + y^2 \leq 1, z = 1$ and $x^2 + y^2 \leq 4, z = 2$.

Problem 3. Find the flux of the vector field $\vec{F} = (y^2 + \ln(y^2 + z^2))\vec{i} + \sqrt{x^2 + \sqrt{z^4 + 1}}\,\vec{j} + (e^{x\cos y^2} + 2z)\vec{k}$ outward across the sphere $x^2 + y^2 + z^2 = a^2$.

Problem 4. Let C be the curve that consists of the intersection of the plane $2x + y + z = 5$ with the square tube consisting of planes $x = 0, x = 1, y = 0$, and $y = 1$, oriented counterclockwise as viewed from above. Find the circulation of the vector field $\vec{F} = -y\vec{i} + \frac{1}{2}z^2\vec{j} + 2\vec{k}$ along C.