Math 208 Fall 2018 **Exam 3**

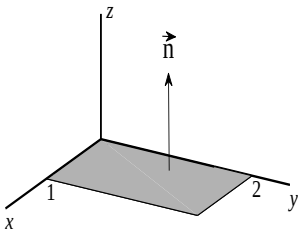
Print Your Name Legibly: _____ **Score:** _____

Instructions: You must show supporting work to receive full and partial credits. No calculator, textbook, lecture notes, or formula sheets are allowed.

1(20pts) A constant vector field $\vec{F} = \vec{i} + 2\vec{j} + 3\vec{k}$ is given. Find the following:

(a) The line integral of the vector field along the straight line segment from $(1, 0, 1)$ to $(1, 1, 0)$.

(b) The flux of the vector field through the rectangle as shown.



2(15pts) Find the value of the line integral of the vector field $\vec{F}(x, y, z) = x\vec{i} + y\vec{j} + z\vec{k}$ along the circle $x^2 + y^2 = 1,\ z = 0$ from $(1, 0, 0)$ to $(0, 1, 0)$, going counterclockwise when looking down from the z-axis.

(*Page 1. Continue on Next Page ...*)

3(15pts) Set up an iterated integral for the flux of vector field $\vec{F}(x,y,z) = \vec{i} + \vec{j} + 2x\vec{k}$ through the part of the paraboloid $z = f(x,y) = x^2 + y^2$ that is in the first octant, below $z = 4$, and oriented upward. **Do not evaluate the integral.**

4(15pts) Use Green's Theorem to find the value of the line integral for the vector field $\vec{F}(x,y) = \langle y+1, 2x + \sin(y^2)\rangle$ around the circle $(x-1)^2 + y^2 = 1$, going counterclockwise in one full revolution.

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5(20pts) (a) Use the curl test to show this vector field $\vec{F}(x, y) = \langle \sin(y) - 1, x\cos(y) + 1 \rangle$ is conservative, i.e. path-independent.

(b) Show work to find a potential function f for $\vec{F}$.

(c) Find the value of the line integral of the vector field from $(1, 0)$ to $(0, 2)$ on the ellipse $x^2 + y^2/2 = 1$.

6(15pts) Use the Divergence Theorem to find the value of the flux for the vector field $\vec{F}(x, y, z) = (z + y)\vec{i} + (x + z)\vec{j} + (z + y)\vec{k}$ through the surface of the cylinder $x^2 + y^2 \leq 4,\ 0 \leq z \leq 1$ from inside out.

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2 Bonus Points: What is the state bird of Nebraska?