Math 208 Fall 2019 **Exam 3** **Section:** ____________

Print Your Name Legibly: ____________________ **Score:** ____________

Instructions: You must show supporting work to receive full and partial credits. No textbook, notes, cheat sheets, calculators allowed.

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

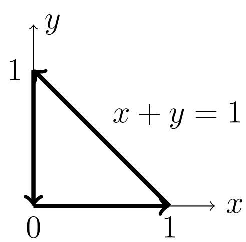
(b) Find the flux of the vector field $\vec{F} = \vec{i} + 2\vec{j} + 3\vec{k}$ through a square of area 2 on the xz-plane, oriented in the direction of the y-axis.

(c) For $\vec{F}(x, y, z) = (x^2 + y)\vec{i} + (y + 2z)\vec{j} + 3x^2\vec{k}$, find the divergence of $\vec{F}(x, y, z)$ at the point $(1, 2, 0)$.

2(15pts) Let $\vec{F}(x, y, z) = z^2\vec{i} + x\vec{j} + y\vec{k}$. Set up an integral in one variable for the line integral $\int_C \vec{F}(\vec{r}) \cdot d\vec{r}$ along the line segment C from $(1, 1, 1)$ to $(1, 2, 0)$. **Do not evaluate the integral.**

3(20pts) Let $\vec{F}(x,y,z) = z\vec{i} + 2\vec{j} + 3\vec{k}$. Set up an iterated integral for the flux $\int_S \vec{F}(\vec{r}) \cdot d\vec{A}$ of $\vec{F}$ through the paraboloid $S: z = x^2 + y^2$, oriented upward, for (x,y) from the quarter disk $D:\ x \geq 0$, $y \geq 0$, $x^2 + y^2 \leq 1$. **Do not evaluate the integral.**

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

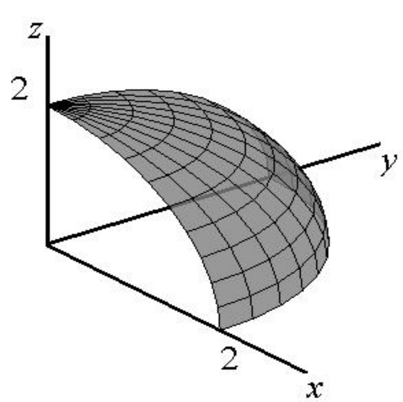


5(20pts) (a) Use the curl test to show this vector field $\vec{F} = \langle 2xy + 1, x^2 + 2 \rangle$ is conservative.

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

(c) Find the value of the line integral of the vector field from $(1, 0)$ to $(0, 1)$ on the line through the points.

6(15pts) Use the Divergence Theorem to find the flux of the vector field $\vec{F}(x, y, z) = (y\vec{i} + z\vec{j} + (x + y + 2z)\vec{k}$ through the surface of the solid bounded by coordinate planes $x = 0,\ y = 0,\ z = 0,$ and the sphere $x^2 + y^2 + z^2 = 4$ as shown, oriented outwards. (You can use the formula for the volume of a ball of radius R: $V = \frac{4}{3}\pi R^3$.)



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