Mv Calc, Ch 15B PT Good luck to: ________________________________ I ▯ the $\iint\limits_R \vec{F}\cdot\left(\vec{r}_u \times \vec{r}_v\right) dA$ capacitor.

Directions: You may not use a calculator for the exam. Show convincing evidence to receive any partial credit. Part 1 will be taken over a 50 minute class meeting and is made of questions 1 – 4. Part 2 will be taken at the next class meeting, with maximum allotted time as 50 minutes, and will be made of questions 5 and 6.

Part 1 is made of questions 1 – 4.

1. Let $\vec{F}(x,y,z)=\langle 2zx\,,\,y^2,-xz\rangle$. Find $\iint\limits_\sigma \left(\vec{F}\cdot\vec{n}\right) dS$ where σ is that portion of the cube $0\le x\le 1$, $0\le y\le 1$, $0\le z\le 1$ with inward unit normal orientation, as follows:

a) without the use of the Divergence Theorem. b) use The Divergence Theorem.

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2. Evaluate $\iint\limits_\sigma \left(x^2+y^2-z\right) dS$ where σ is that portion of the paraboloid $z=4-x^2-y^2$ between $z=1$ and $z=2$.

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3. Use Stokes' Theorem to evaluate $\int\limits_C y^2dx+x^2dy-\left(x+z\right)dz$ where C is a triangle in the xy plane with vertices (0, 0, 0) , (1, 0, 0), and (1 , 1 , 0) with a counterclockwise orientation looking down the positive *z*-axis.

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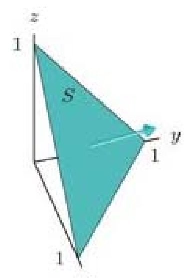
4. Compute the flux of $\vec{F}(x,y,z)=\langle x^2,y^2,z^2\rangle$ through the surface S shown below. Note: The arrow piercing through surface S shown below indicates the direction of the unit normal of S.



Part 2 is made of questions 5 and 6.

5. Use The Divergence Theorem to evaluate $\iint\limits_\sigma \left(\vec{F}\cdot\vec{n}\right) dS$ where $\vec{F}(x,y,z)=yz\vec{i}+xy\vec{j}+xz\vec{k}$, $\vec{n}$ is the outer unit normal to σ, and σ is the surface enclosed by the cylinder $x^2+y^2=1$ and the planes $y=-1$ and $y=1$.

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6. Use Stokes' Theorem to evaluate $\iint\limits_\sigma \left(\left(\text{curl}\,\vec{F}\right)\cdot\vec{n}\right) dS$ where $\vec{F}(x,y,z)=y\vec{k}$ and σ is that portion of the ellipsoid $4x^2+4y^2+z^2=4$ for which $z\ge 0$.