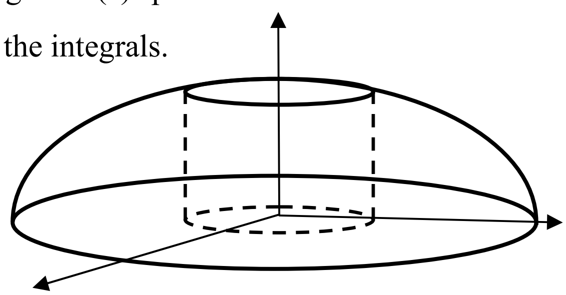
SI Session: Exam III Review | Prof. Stockton : Calculus III
Mondays: 4:50 PM – 6:20 PM | Spring 2009
Tuesdays: 1:30 PM – 3:00 PM | SI Leader : Neil Jody
Wednesdays: 4:50 PM – 6:20 PM
Room 1245 SNAD

[1] Let $\vec{F}(x,y,z)=\langle xz+y^2, xy+xz, x^2yz^2\rangle$. Calculate (a) div $\vec{F}$, (b) curl $\vec{F}$.

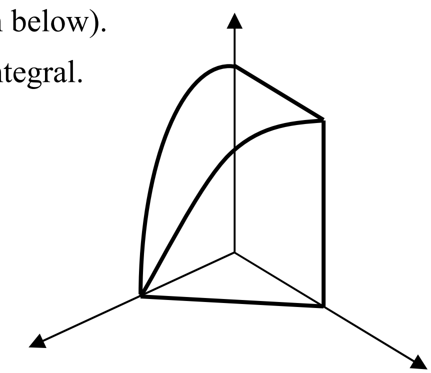
[2] Let Q be the region in space inside the sphere $x^2+y^2+z^2=4$, above the *xy*-plane, and outside the cylinder $x^2+y^2=1$ (see figure). Express $\iiint_Q \left(x^2+y^2+z^2\right)dxdydz$ as an iterated integral in (a) spherical coordinates and (b) cylindrical coordinates. Do not evaluate the integrals.



[3] Evaluate the following triple integral $\int_{-1}^{2}\int_{0}^{x}\int_{x}^{x-4z} 6yz\, dydzdx$.

[4] Let C be a smooth curve in the *xy*-plane beginning $(-2,3)$ and $(0,-1)$. Use the fundamental Theorem Theorem of Line Integrals to evaluate: $\int_C \left(2x+y^2\right)dx+\left(2xy+2\right)dy$

[5] Let Q be the solid in the first octant bounded by the coordinate planes and the graphs of $z=4-x^2$ and $x+y=2$ (see diagram below). Express $\iiint_Q f(x,y,x)\,dV$ as a triple iterated integral.



[6] Let C be the space curve generated by $\vec{r}(t)=\left(\ln t, t, t^2\right)$ for $1\le t\le e$. Calculate the work done by the vector field $\vec{F}(x,y,z)=\langle 2y, 3z, x\rangle$ along C.

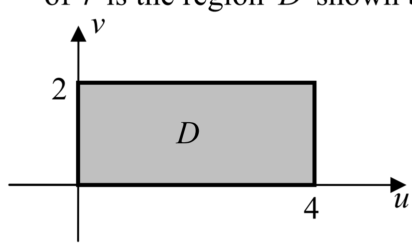
[7] Rewrite the integral $\int_0^2\int_0^{4-2x}\int_0^{\frac{12-6x-3y}{4}} f(x,y,z)\,dzdydx$ in the order $dydxdz$.

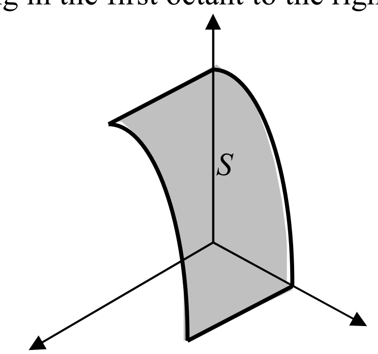
[8] Use Green's Theorem to evaluate the line integral $\int_C (x - xy)\,dx + (2xy + y^2)\,dy$ where C is the triangle with vertices $(0,0)$, $(0,2)$, and $(2,2)$, oriented counterclockwise.

[9] Let C be the portion of the circle $x^2 + y^2 = 9$ from $(0,3)$ to $(-3,0)$. Evaluate the following line integral $\int_C -y^2 dx + xy\,dy$

[10] Calculate $\int_C \frac{8x}{y}\,ds$ where C is the portion of the curve $x = y^2$ from $(1,1)$ to $(4,2)$.

[11] Let S be the portion of the cylinder $z = 4 - y^2$ lying in the first octant to the right of the plane $y = 4$ (see diagram).
A parametrization of S is $\vec{r}(u,v) = (u, v, 4 - v^2)$ where the domain of $\vec{r}$ is the region D shown below:





(a) Express the surface area of S as an iterated integral over the region D, but don not evaluate the integral.

(b) Evaluate the surface integral $\iint_S 4y\,dS$.

(c) Calculate the upward flux of $\vec{F}(x,y,z) = \langle yz, 2x + y, y^2 + z \rangle$ across S.