SI Session: April 20th,21st & 22nd, 2009
Mondays: 4:50 PM – 6:20 PM
Tuesdays: 1:30 PM – 3:00 PM
Wednesdays: 4:50 PM – 6:20 PM
Room 1245 SNAD

Prof. Stockton : Calculus III
Spring 2009
SI Leader : Neil Jody

[1] Let *V* be the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 4$ and below the plane $z = -1$. Express *V* as an integral in (a) cylindrical coordinates and (b) spherical coordinates.

[2] Let *Q* be the solid inside the sphere $x^2 + y^2 + z^2 = 4$ and outside the cylinder $x^2 + y^2 = 1$. Express the volume of *Q* as an iterated integral in(a)cylindrical coordinates and(b)spherical coordinates.

[3] Rewrite the integral $\int_0^4 \int_0^{\frac{y}{2}} \int_0^{y-2x} xyz\,dz\,dx\,dy$ as an iterated integral in the order $dydzdx$.

[4] Let Q be the wedge in the first octant cut from the cylinder $y^2 + z^2 = 1$ by the planes $y = x$ and $x = 0$ (see diagram). Express $\iiint_Q z\,dV$ as a triple iterated integral. Do not evaluate the integral.

[5] Evaluate the integral $\int_{-1}^{3} \int_{y}^{3} \int_{2z}^{2y-z} z\,dx\,dz\,dy$.

[6] A thin plate has the shape of the triangular region *D* with vertices (0,0), (1,0), (0,1). If the density of *D* at the point (x, y) is $\delta(x, y) = xy$, calculate the mass of *D*.

[9] Determine if the following vector field is conservative. If it is, find a potential function for the vector field.

(a) $\vec{F}(x, y) = 3x^2y^2\hat{i} + 2x^3y\hat{j}$ (b) $\vec{F}(x, y) = \dfrac{2y}{x}\hat{i} - \dfrac{x^2}{y^2}\hat{j}$

(c) $\vec{F}(x,y)=\dfrac{2x\hat{i}+2y\hat{j}}{\left(x^2+y^2\right)^2}$ (d) $\vec{F}(x,y,z)=e^z\left(y\hat{i}+x\hat{j}+\hat{k}\right)$

(e) $\vec{F}(x,y,z)=y^2z^3\hat{i}+2xyz^3\hat{j}+3xy^2z^2\hat{k}$

[10] Find $\operatorname{curl}\vec{F}$ for the vector field at the given point.

(a) $\vec{F}(x,y,z)=x^2z\hat{i}-2xz\hat{j}+yz\hat{k}$, $(2,-1,3)$

(b) $\vec{F}(x,y,z)=e^{-xyz}\left(\hat{i}+\hat{j}+\hat{k}\right)$, $(3,2,0)$

[11] Find the divergence for the vector field $\vec{F}$.

(a) $\vec{F}(x,y,z)=xe^x\hat{i}+ye^y\hat{j}$

(b) $\vec{F}(x,y,z)=\ln\left(x^2+y^2\right)\hat{i}+xy\hat{j}+\ln\left(y^2+z^2\right)\hat{k}$