SI Session: Dec. 1st & 3rd, 2008
Mondays: 1:30 PM – 3:00 PM & 4:50 PM – 6:20 PM
Wednesdays: 1:30 PM – 3:00 PM & 4:50 PM – 6:20 PM
Room 1239 SNAD(Wed. early rm. 1121)

Prof. Stockton : Calculus III
Fall 2008
SI Leader : Neil Jody

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

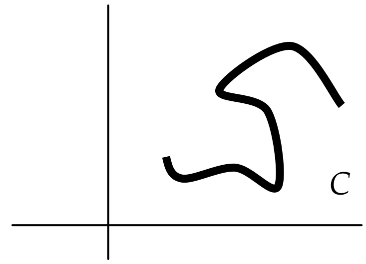
$$\vec{F}(x,y) = \left\langle 2x - y^2, y^3 - 2xy \right\rangle$$

[2] Let $\vec{F}(x,y,z) = \left\langle M(x,y,z), N(x,y,z), P(x,y,z) \right\rangle$ be a vector field. Show that $Div(Curl\vec{F}) = 0$.

[3] Let C be the curve in space parametrized by $\vec{r}(t) = \left(t, t^2, 1-t\right)$ for $t \in [0, 2]$. An object moving along C with the orientation prescribed by $\vec{r}$ is acted on by the force field $\vec{F}(x, y, z) = \langle x, x-z, 2y \rangle$. Calculate the work done by $\vec{F}$.

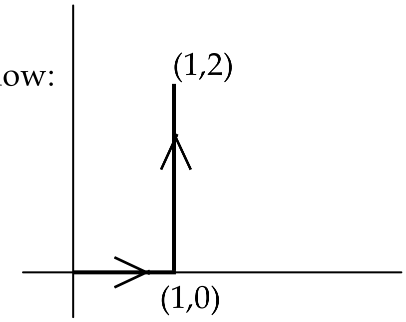
[4] A smooth curve C lying in the xy-plane begins at the point (1, 1) and ends at (3, 2) (see figure). Calculate the following line integral:

$$\int_C (2x - y^2)dx + (y^3 - 2xy)dy$$



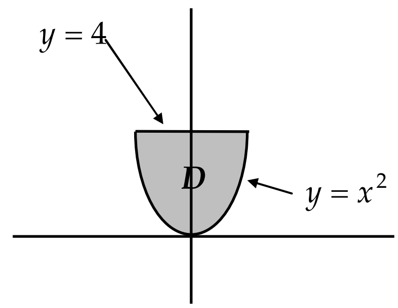
[5] Compute the following line integral: $\int_C (x^2 + y^2)dx - xydy$ where C is the upper arc of the circle $x^2 + y^2 = 4$, traversed counterclockwise.

[6] Evaluate $\int_C y\,ds$ where C is the path shown below:



[7] Use Green's Theorem to calculate the following line integral:

$\int_C (x^2 + xy)dx + x^2 y^3 dy$ where C is the boundary of the region D shown below *traversed counterclockwise*.



[8] Use Green's Theorem to evaluate the line integral $\int_C y^2 dx + 6xy dy$ where C is the path from (0,0) to (1,0) along $y = 0$, from (1,0) to (1,1) along $x = 1$, and from (1,1) to (0,0) along $y = \sqrt{x}$

[9] Let S represent the portion of the plane $x + y + 2z = 4$ lying inside the cylinder $x^2 + z^2 = 1$.

(a) Give a parametrization of S.
(b) Calculate the surface area of S.
(c) Evaluate $\iint_S (4 - y)\,dS$

[10] Let S represent the portion of the paraboloid $z = 4 - x^2 - y^2$ that lies in the first octant.

(a) Give a parametrization of S.
(b) Calculate the surface area of S.
(c) Evaluate the surface integral $\iint_S \frac{x}{\sqrt{17 - 4z}} dS$