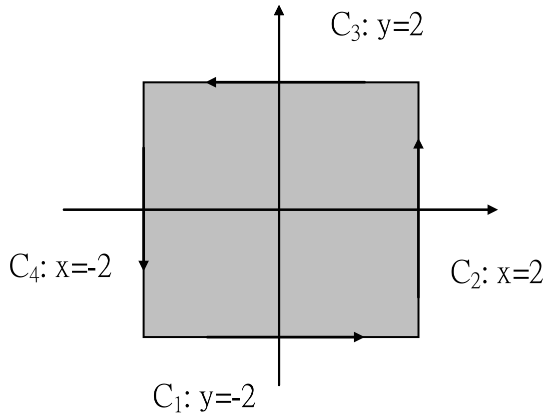
HOMEWORK #4 (9.9 ~9.12)

Due on March 22

1) Consider the line integral in Example 4 (page 518) on the curve C consisting of the four straight segments C_1, C_2, C_3, C_4 $\oint_c \frac{-y}{x^2+y^2}dx + \frac{x}{x^2+y^2}dy$.

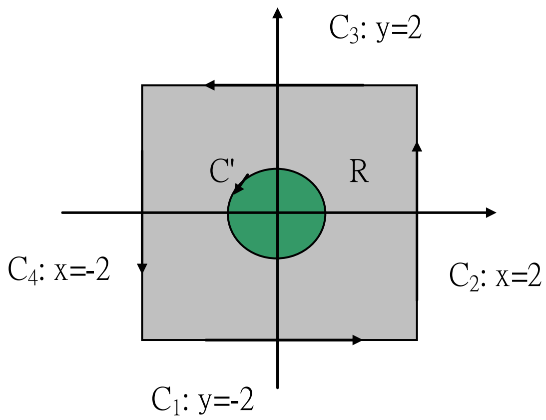
(1) Is Green's theorem applicable to the line integral ? (i.e. Can you relate the line integral to a double integral using Green's theorem) ? Why ?

(2) Compute the line integral on the curve C by using $\oint_c = \int_{c_1} + \int_{c_2} + \int_{c_3} + \int_{c_4}$



2) Consider the line integral in Example 6 (page 519) on the curve C consisting of the four straight segments C_1, C_2, C_3, C_4. Apply the Green's theorem to evaluate line integral on the curve C.

Note that we choose the curve C' to be $x^2 + y^2 = a^2$ where a is small enough so that the circle lies entirely with C.



3) A lamina has the shape of the region bounded by the graph of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

If its density is $\rho(x, y) = 1$, find (Problem 61, page 510).

(1) the moment of inertia about the x-axis of the lamina,

(2) the moment of inertia about the y-axis of the lamina,

(3) the radius of gyration about the x-axis,

(4) the radius of gyration about the y-axis

4) Find the center of mass of the lamina that has the given shape and density

$y = \sqrt{3}x$, $y = 0$, $x = 3$; $\rho(r, \theta) = r^2$ (Problem 13, page 514).

5) Show that the given integral is independent of the path and the evaluate it

$$\int_{(1,0,0)}^{(2,\pi/2,1)} (2x \sin y + e^{3z})dx + x^2 \cos y dy + (3xe^{3z} + 5)dz$$ (Problem 21, page 502).