Mechanics Based Problems

1. The table of values below is for a function $f(x, y)$ defined on $R = [1, 3] \times [0, 4]$.

$x \backslash y$	0	1	2	3	4
1.0	2	0	-3	-6	-5
1.5	3	1	-4	-8	-6
2.0	4	3	0	-5	-8
2.5	5	5	3	-1	-4
3.0	7	8	6	3	0

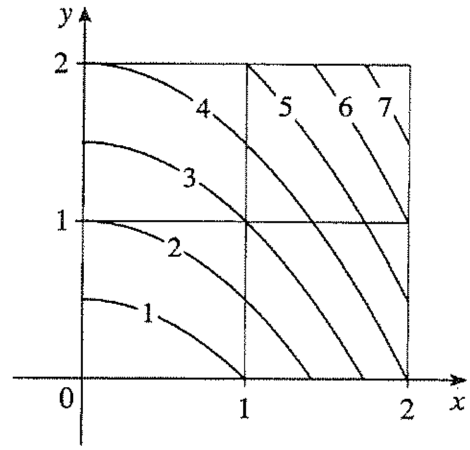
(a) Estimate the value of $\int\int_R f(x, y)dA$ using the Midpoint Rule with four regions.

$= \underline{\underline{-6}}$ ans

(b) Estimate the value of $\int\int_R f(x, y)dA$ with 8 regions choosing the sample point to be the points farthest from the origin.

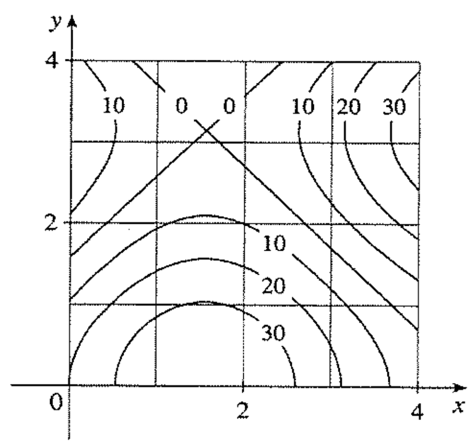
$= \underline{\underline{-13}}$ ans

2. The figure below shows level curves of a function f on the square $R = [0,2] \times [0,2]$. Use them to estimate the volume under the surface to the nearest integer.



≈ 12.7 ans

3. A contour map is shown below for a function f on the square $R = [0,4] \times [0,4]$.



(a) Use midpoints with 4 regions to estimate the volume under the surface.

(b) Estimate the average value of f.

$A = 244$ ans

$f_{Avg} = 15.25$ ans

Problem Solving Problems

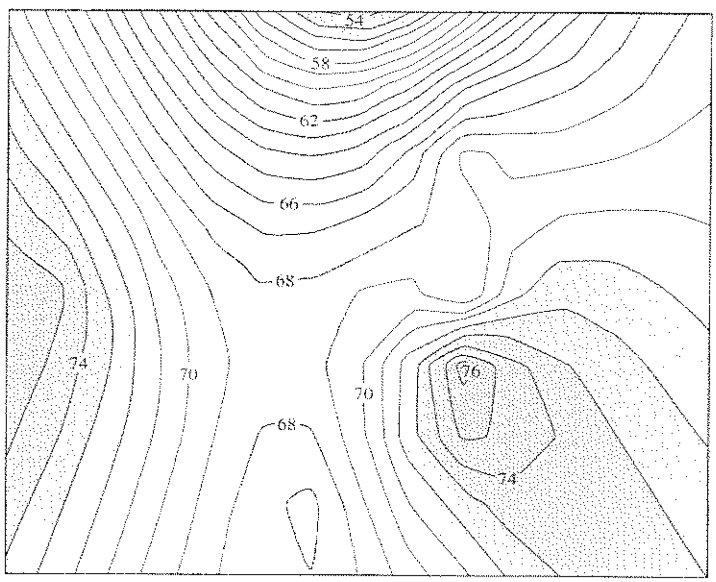
1. A 20 by 30 foot swimming pool is filled with water. The depth is measured at 5 foot intervals, starting at one corner of the pool, and the values are recorded in the table below. Estimate the volume of water in the pool.

	0	5	10	15	20	25	30
0	2	3	4	6	7	8	8
5	2	3	4	7	8	10	8
10	2	4	6	8	10	12	10
15	2	3	4	5	6	8	7
20	2	2	2	2	3	4	4

$A = 3600$ midpoint method

ans

2. The contour map below shows the temperature in degrees Fahrenheit, at 3:00 P.M. on May 1, 1996, in Colorado. The state measures 388 miles east to west and 276 miles north to south. Use midpoints to estimate the average temperature in Colorado at that time.



$= 69.2°$

ans