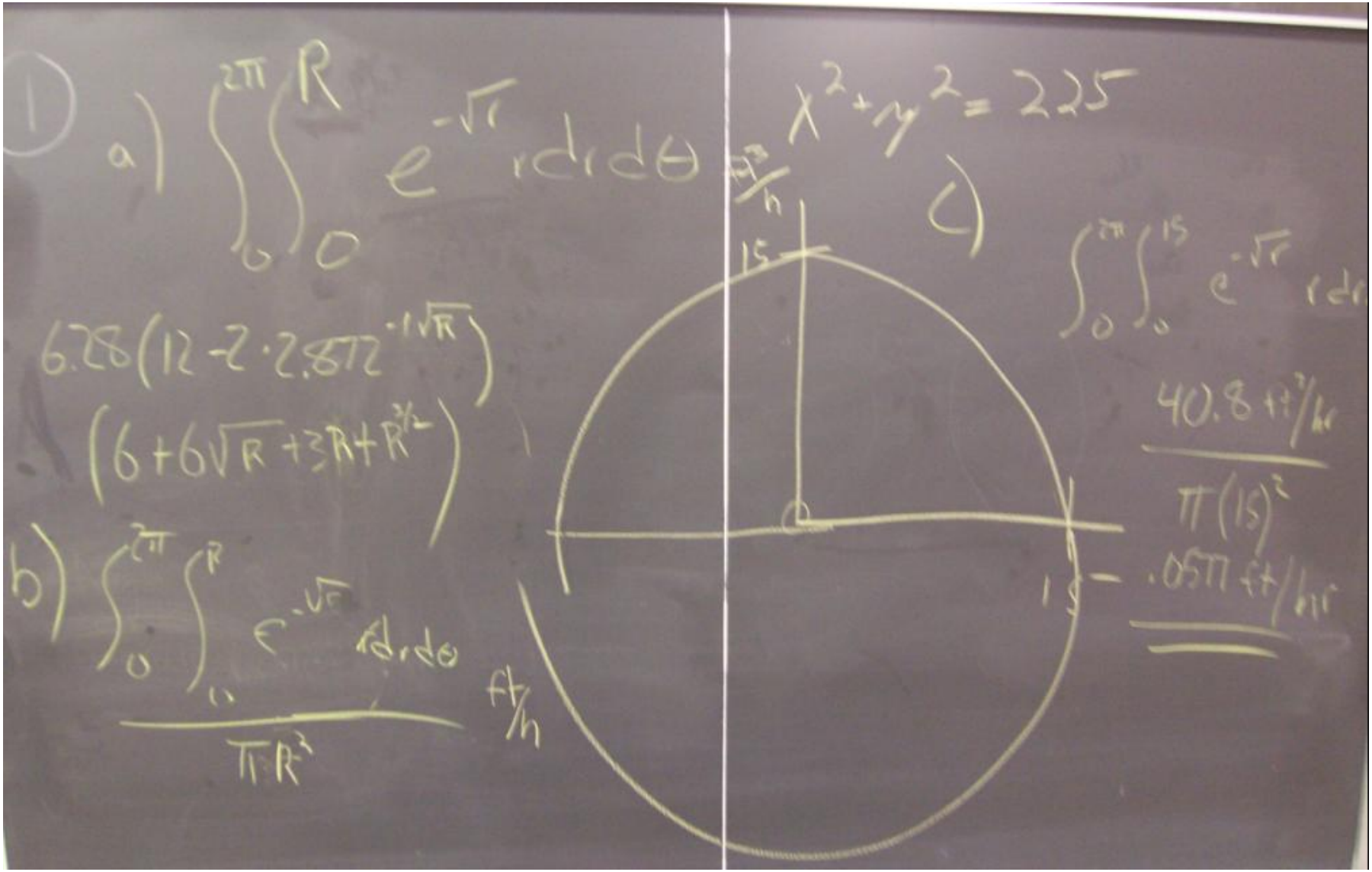
MA205 Multivariable Block Problems

Courtesy of MAJ DeGregory's

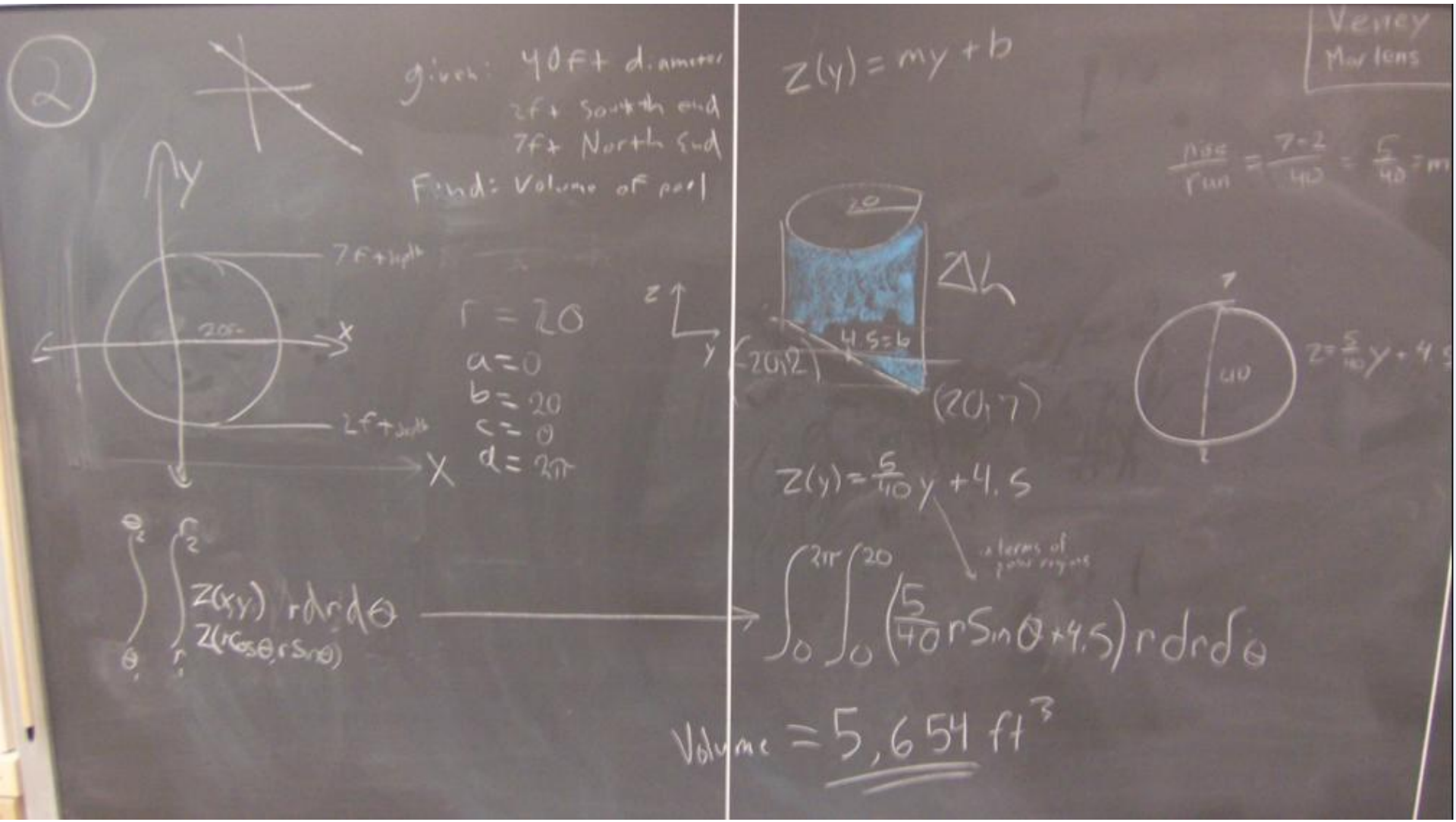
C and D hour students

Disclaimer: All the work on the following slides is done by cadets and for cadets. All the answers have been verified by cadets. Although the pride and workmanship of his students is an indirect reflection on the priorities that MAJ DeGregory sets in the classroom - MAJ DeGregory assumes no direct responsibility for incorrect work or wrong answers.

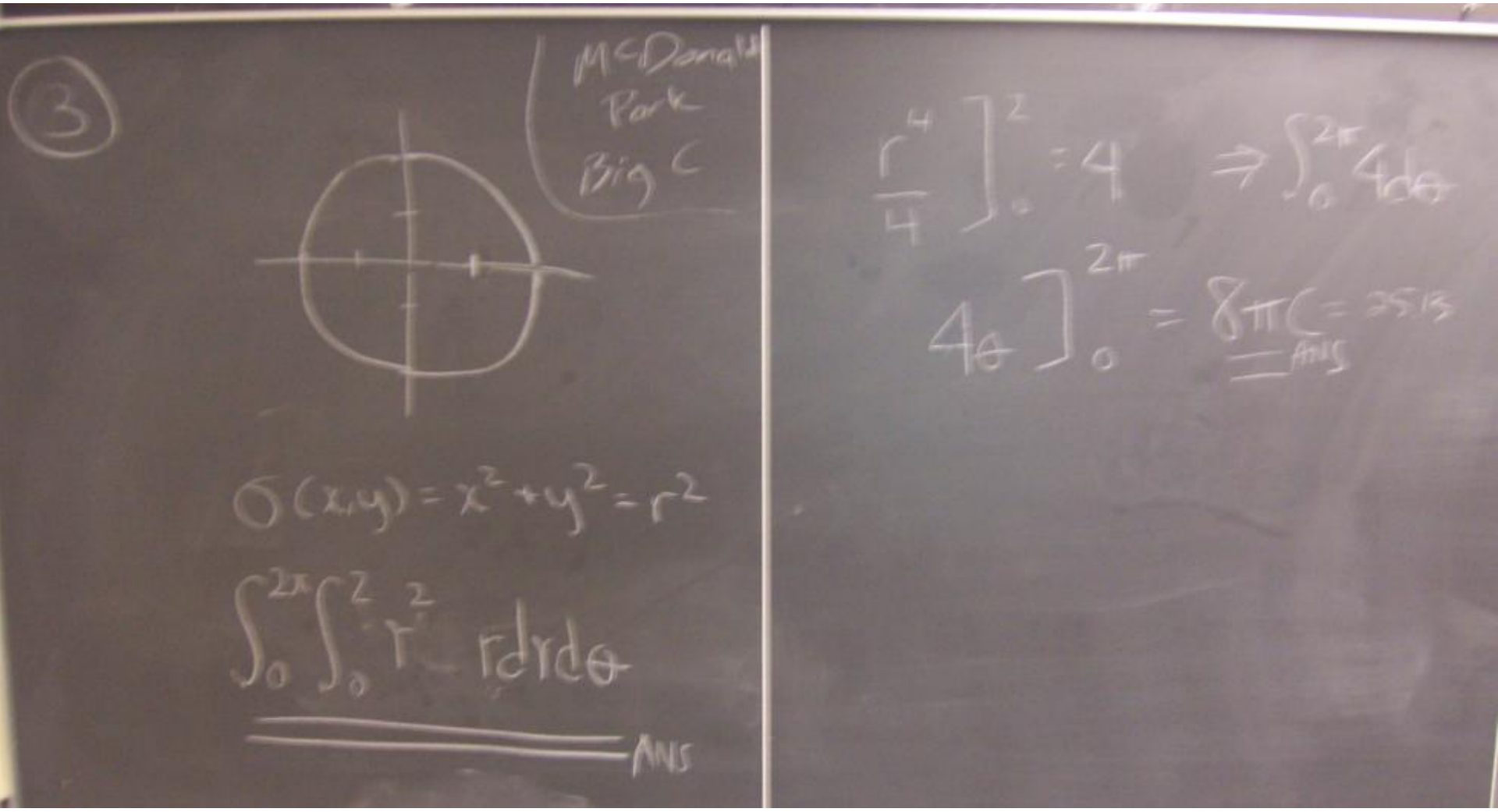
Problem 1


1
a)
$\int_0^{2\pi}\int_0^{R} e^{-\sqrt{r}}\, r\,dr\,d\theta$
$6.28(12-2\cdot 2.8^{-1\sqrt{R}})$
$(6+6\sqrt{R}+3R+R^{3/2})$
b)
$\int_0^{2\pi}\int_0^{R} e^{-\sqrt{r}}\, r\,dr\,d\theta$
πR^2
ft/h
$x^2+y^2=225$
c)
15
$\int_0^{2\pi}\int_0^{15} e^{-\sqrt{r}}\, r\,dr$
40.8 ft³/hr
$\pi(15)^2$
.057 ft/hr

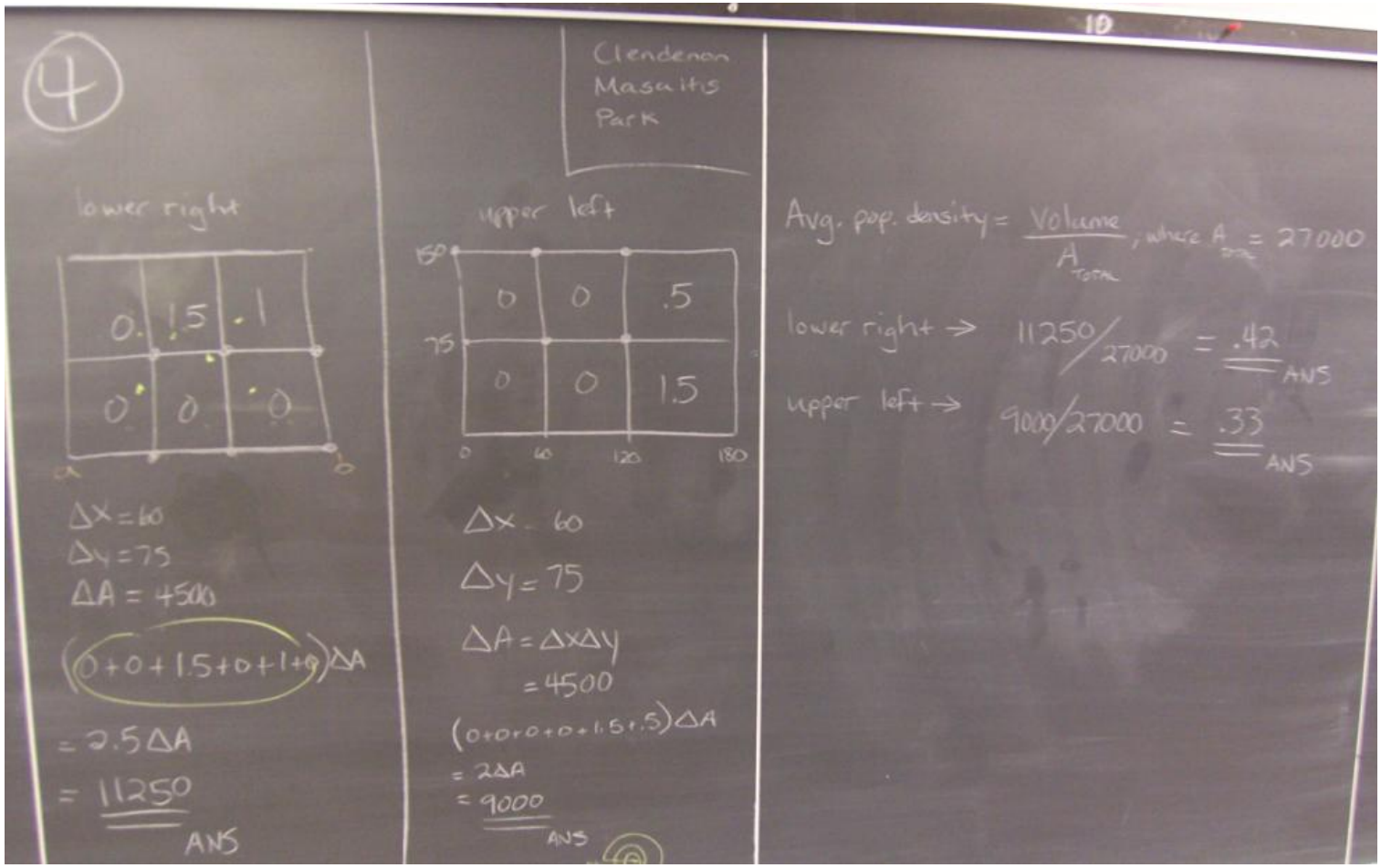
Problem 2


2
given: 40ft diameter
2ft South end
7ft North end
Find: Volume of pool
y
x
7ft height
20
2ft South
r = 20
a = 0
b = 20
c = 0
d = 2π
z
y
x
z(y) = my + b
20
Δh
4.5=b
(20,2)
(20,7)
rise/run = 7-2/40 = 5/40 = m
7
40
z = 5/40 y + 4.5
∫ from θ1 to θ2 ∫ from r1 to r2 z(x,y) r dr dθ
z(r cosθ, r sinθ)
z(y) = 5/40 y + 4.5
4 terms of power regress
∫ from 0 to 2π ∫ from 0 to 20 (5/40 r sinθ + 4.5) r dr dθ
Volume = 5,654 ft³

Problem 3

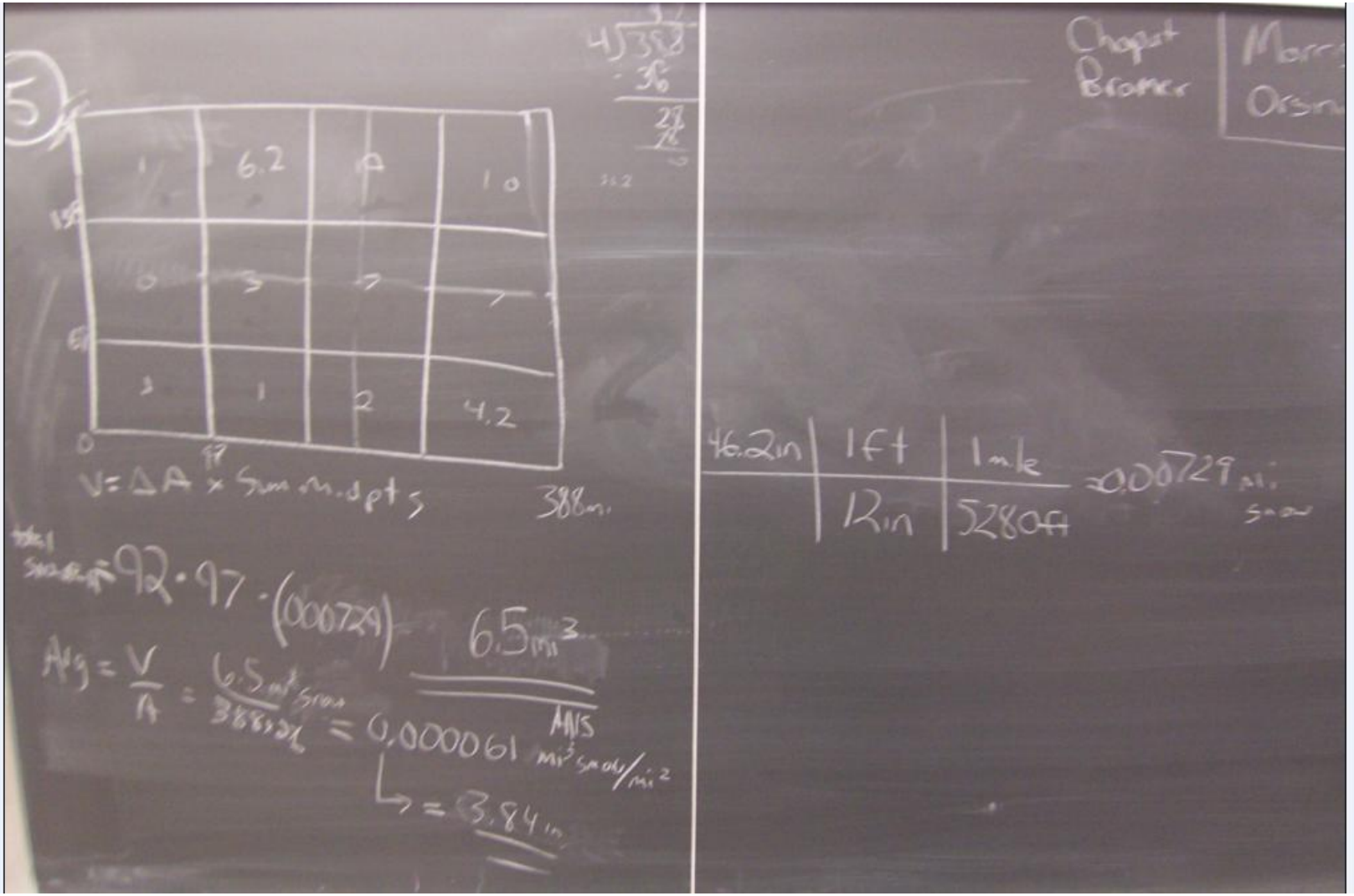

3
McDonald Park
Big C
$\sigma(x,y) = x^2 + y^2 = r^2$
$\int_0^{2\pi}\int_0^2 r^2 \, r\,dr\,d\theta$
ANS
$\frac{r^4}{4}\Big]_0^2 = 4 \Rightarrow \int_0^{2\pi} 4\,d\theta$
$4\theta\Big]_0^{2\pi} = 8\pi C = 25.13$
ANS

Problem 4



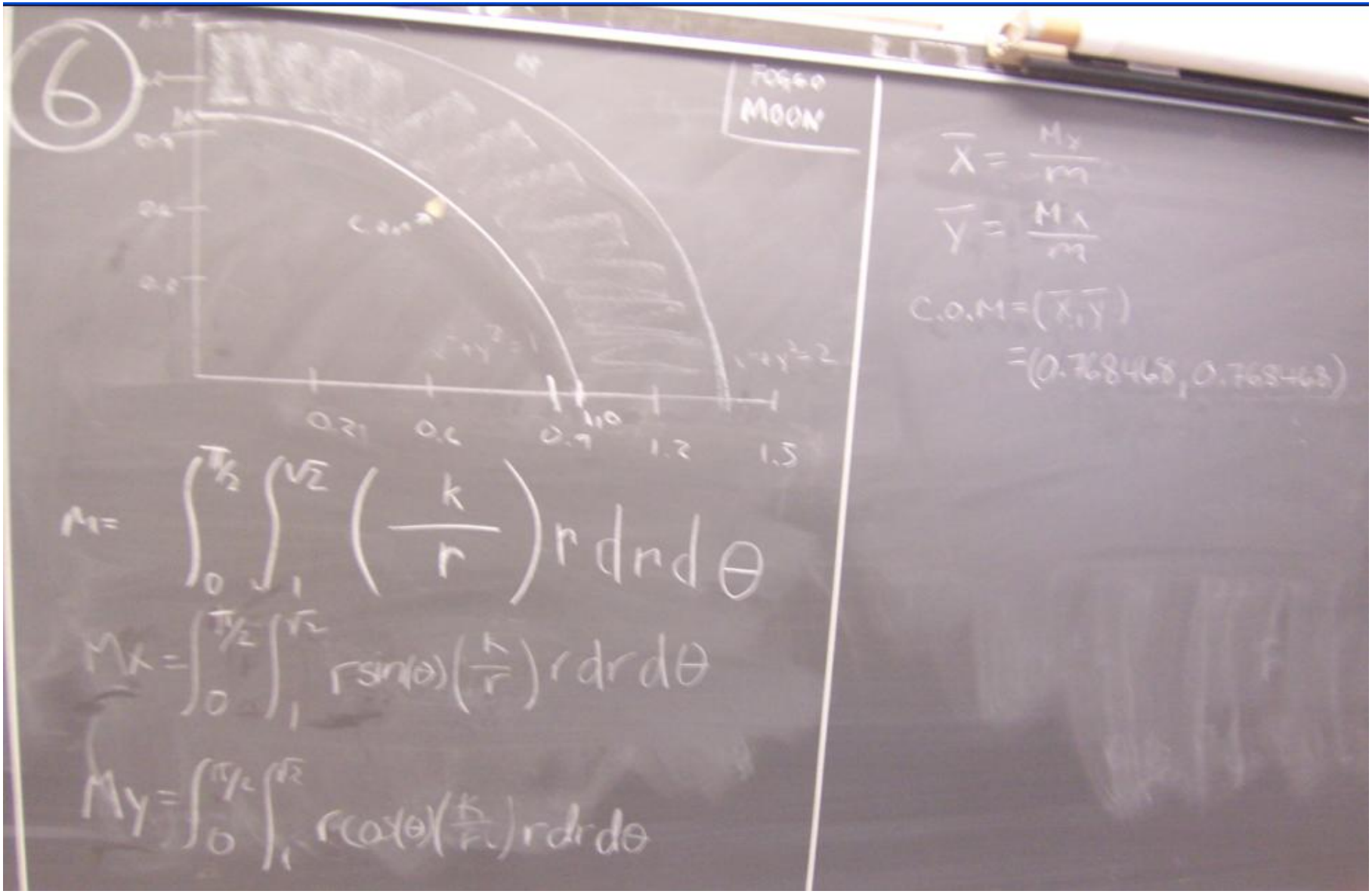
During D Hour we talked about what an upper and lower estimate means and that it does not equate to using upper left or lower right methods, in fact you do not need to be so rigid in the system you use to select the representative height for each sub-region. The solution here may not insure an actual overestimate/underestimate.

Problem 5

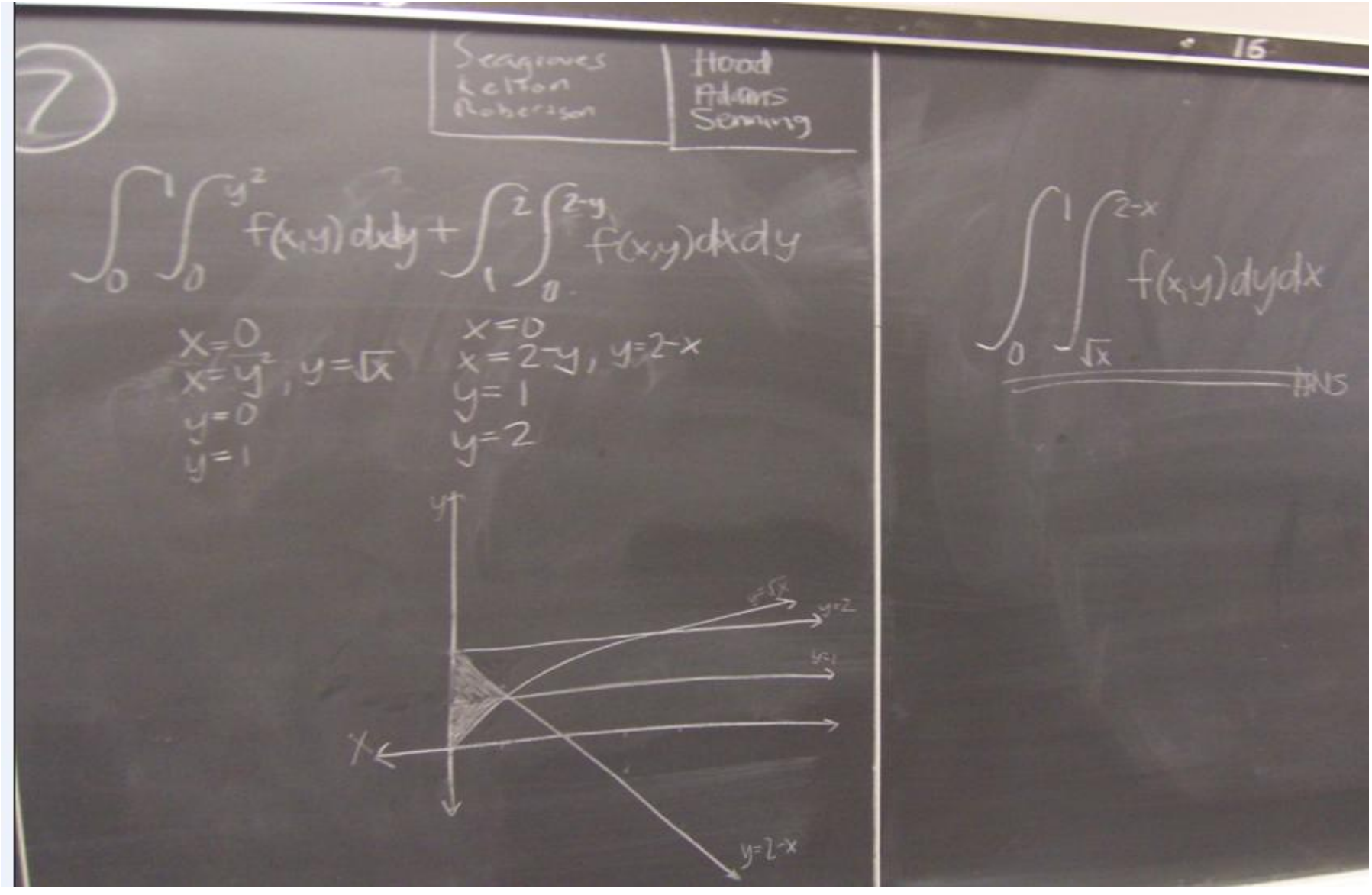


D hour thought the process here was valid but that the math or numbers might be off.

Problem 6


6
FOGGO
MOON
0.2
0.6
1.0
1.2
1.5
$M = \int_0^{\pi/2} \int_1^{\sqrt{2}} \left(\frac{k}{r}\right) r \, dr \, d\theta$
$M_x = \int_0^{\pi/2} \int_1^{\sqrt{2}} r\sin(\theta)\left(\frac{k}{r}\right) r \, dr \, d\theta$
$M_y = \int_0^{\pi/2} \int_1^{\sqrt{2}} r\cos(\theta)\left(\frac{k}{r}\right) r \, dr \, d\theta$
$\bar{x} = \frac{M_y}{m}$
$\bar{y} = \frac{M_x}{m}$
C.O.M $= (\bar{x}, \bar{y})$
$= (0.768468, 0.768468)$

Problem 7


7
Seagraves
Kelton
Roberson
Hood
Adams
Semmes
16
$\int_0^1 \int_0^{y^2} f(x,y)\,dx\,dy + \int_1^2 \int_0^{2-y} f(x,y)\,dx\,dy$
$x=0$
$x=y^2$, $y=\sqrt{x}$
$y=0$
$y=1$
$x=0$
$x=2-y$, $y=2-x$
$y=1$
$y=2$
$\int_0^1 \int_{\sqrt{x}}^{2-x} f(x,y)\,dy\,dx$
y
x
$y=\sqrt{x}$
$y=2$
$y=1$
$y=2-x$

D Hour's WPR Prediction

Disclaimer: This prediction is the result of critical thinking and reasoning by cadets in MAJ DeGregory's D Hour. This is by no means a guarantee or a promise of what will be on the WPR. The instructor remained totally impartial during this exercise so as not to bias the prediction in one way or the other. Good luck studying!

LR (100)	FR (150)
1. Estimation	1. C.O.M./density
2. Rect. Region*	2. General Region*
	3. Polar Region*
* Could ask converting between methods, drawing region, or what it means.	