Last Initial C

Section C01

Name Captain Conundrum

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MIDTERM I

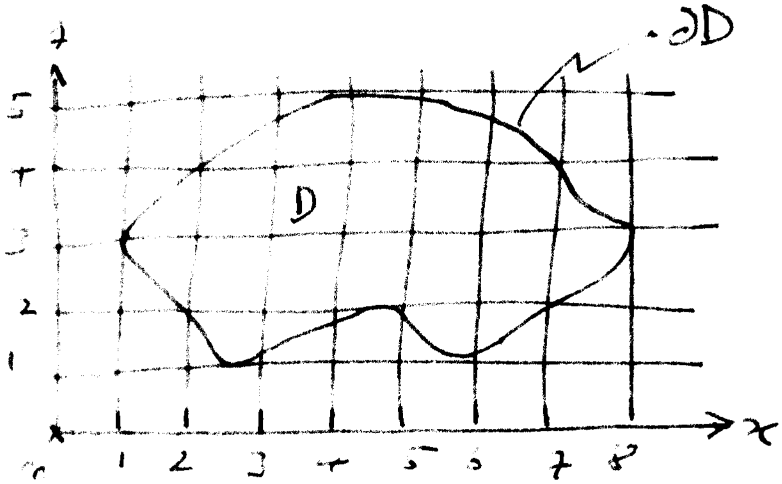
21C, Monday May 16, 2005

Declaration of honesty: I, the undersigned, do hereby swear to uphold the highest standards of academic honesty, including, but not limited to, submitting work that is original, my own and unaided by notes, books, calculators, mobile phones, bread machines, IPODs, fluffy toys or any other electronic device.

Signature __________ **Date** TODAY

(Working space for Question 1)

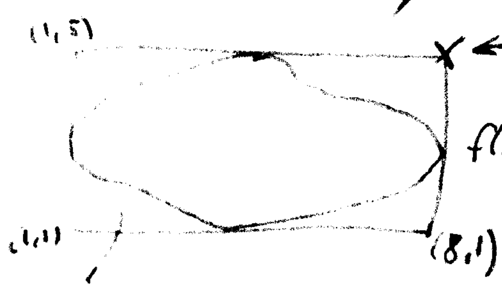
(i)



(ii) $12 < A < 24$

(iii) $A = \int_D dA$

(iv) use this rectangle for b



← evaluate f here

$f(8,5) = \sqrt{5^2+8^2}$

$= \sqrt{89}$

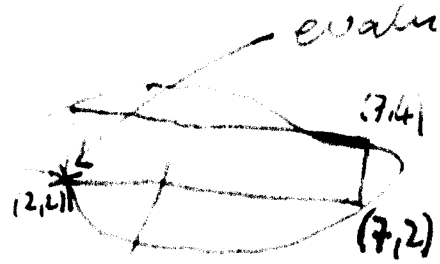
area $4 \cdot 7 = 28$

$$\Rightarrow \underline{b = 28 \cdot f(8,5) = 28 \cdot \sqrt{89}}$$

but for a

evaluate f here

$f(2,2) = \sqrt{2^2+2^2} = 2\sqrt{2}$



$$\Rightarrow \underline{a = 10 \cdot f(2,2) = 20\sqrt{2}}$$

area $5 \cdot 2 = 10$

3

(Working space for Question 1)

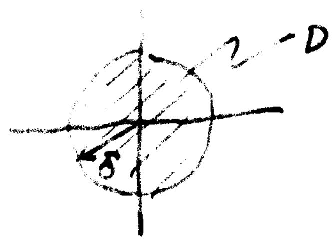
i) $f(x,y) = \sqrt{x^2+y^2}$

ii) $\frac{\partial f}{\partial x} = \frac{2x}{2\sqrt{x^2+y^2}} = \frac{x}{\sqrt{x^2+y^2}}$

$\lim_{(x,y)\to(0,0)} \frac{\partial f}{\partial x}$ does NOT exist (along $x=0$ get 0,
along $x=y$ get $\frac{1}{\sqrt{2}}$)

iii) $\lim_{(x,y)\to(0,0)} \sqrt{x^2+y^2} = 0$

Proof Consider a disc radius δ about $(0,0)$



Clearly if $(x,y) \in D$, we ~~have~~ get

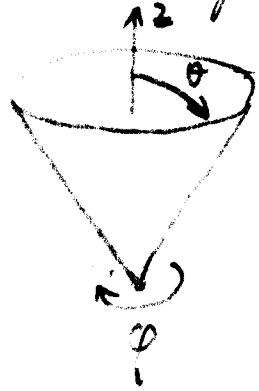
$\sqrt{x^2+y^2} < \delta$

So choosing $\delta = \varepsilon$ we have

$\sqrt{x^2+y^2} = |f(x,y) - 0| < \varepsilon$ QED.

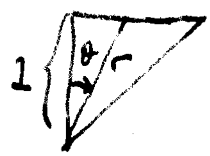
(Working space for Question 1)

viii) The same region sketched above!



$0 \leq \varphi < 2\pi$

$0 \leq \theta \leq \frac{\pi}{4}$



$r\cos\theta = 1$

so at fixed θ, φ

$0 \leq r \leq \frac{1}{\cos\theta}$