Lec 2/27

Monday, February 27, 2017 09:09

Hw #6 Due Fri. March 3.

§3.4 # 1(b), (c), 2, 4, 6, 7

§3.5 # 1

§4.1 # 1, 3, 5, 6, 7, 8, 9

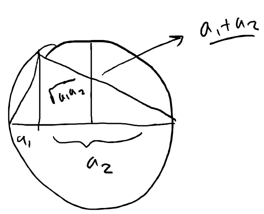
§4.2 # 1, 2, 3, 4, 5, 6, 7

We say a map $f : U \to V$ is <u>onto</u> if every point in V is the image of some points in U.

AG inequality : $\frac{a_1 + \dots + a_n}{n} \geq \sqrt[n]{a_1 \cdots a_n}$

Bernoulli ineq : $(1+x)^n \geq 1 + xn$

Bernoulli is a special case of AG, (prove this) and vice versa



AG: 2 case implies case 4.

Perhaps work on proving AG.

easy induction for powers of 2, use a trick otherwise.

Use calculus of many vars to prove AG

Schaum Series of Books.

$f(x)$ $\quad \eta = y + (\xi - x) f'(x)$ tangent line eqn $\quad (a,b) \cdot (-b,a) = 0.$

$\eta = y - (\xi - x) \frac{1}{f'(x)}$ normal line eqn

$F(x,y) = 0, \quad F_x^2 + F_y^2 \neq 0 \longrightarrow$ this just means $(F_x, F_y) \neq \vec{0}.$

tangent

$$(\xi - x) F_x + (\eta - y) F_y = 0$$

Prove these hold

$$(\xi - x) F_x - (\eta - y) F_y = 0$$

normal

$F(x,y) = 0, \quad G(x,y) = 0.$

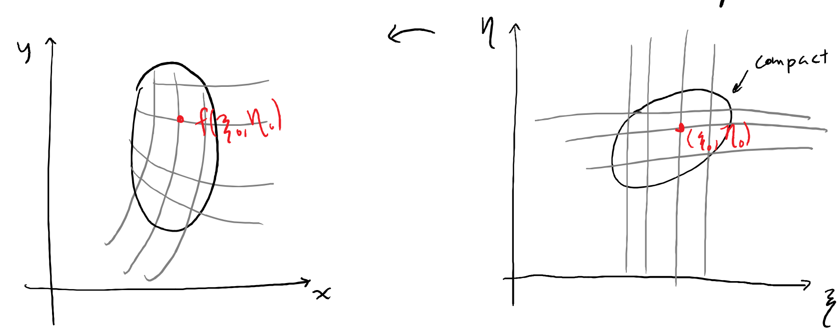
$$F_x G_x + F_y G_y = 0$$

perpendicularity

$$\frac{F_x}{G_x} = \frac{F_y}{G_y} \longleftrightarrow \begin{vmatrix} F_x & F_y \\ G_x & G_y \end{vmatrix} = 0$$

tangency

Prove these, make assumptions of nondegeneracy



ξ KSI

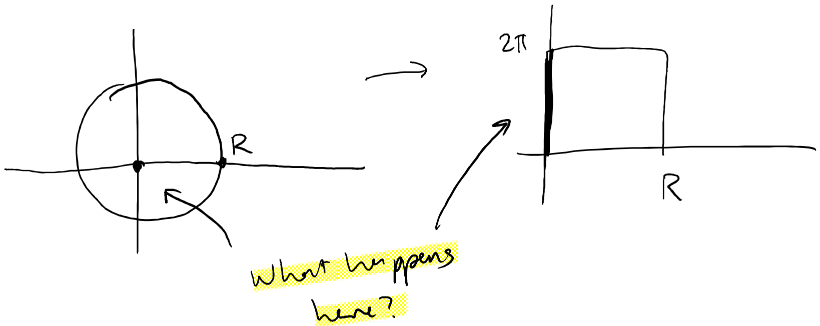
$$x = x(\xi, \eta), \quad y = y(\xi, \eta) \rightleftarrows \xi = \xi(x,y), \quad \eta = \eta(x,y).$$

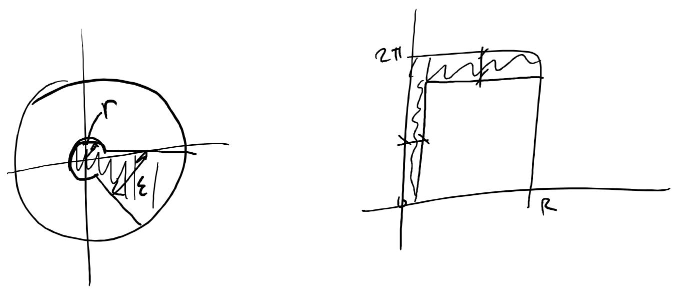
$$\frac{D(x,y)}{D(\xi,\eta)} \cdot \frac{D(\xi,\eta)}{D(x,y)} = 1$$ (assumption of smoothness etc)

$$\begin{vmatrix} \frac{\partial x}{\partial \xi} & \frac{\partial x}{\partial \eta} \\ \frac{\partial y}{\partial \xi} & \frac{\partial y}{\partial \eta} \end{vmatrix}$$ etc.

$x = r \cos(\theta)$ trouble: $r = 0$,

$y = r \sin(\theta)$





Connect r, ε to lengths on right

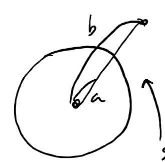
$$\frac{D(x,y)}{D(r,\theta)} = \begin{vmatrix} \cos\theta & -r\cos\theta \\ \sin\theta & r\cos\theta \end{vmatrix} = r$$

Poisson integral

$$\int_0^\infty e^{-y^2}\,dy \cdot \int_0^\infty e^{-x^2}\,dx = \int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\,dx\,dy$$

do this as exercise too

$$x = \frac{\xi}{\xi^2+\eta^2}, \quad y = \frac{\eta}{\xi^2+\eta^2}$$



$ab = 1$

verify this

same ray.

a set $S \subseteq \mathbb{R}$ has measure zero if $\forall \varepsilon > 0$ it can be covered by a system of intervals with total length $< \varepsilon$

How to define in $\mathbb{R}^2$