So far: chapter analysis Stewart Calculus 8e

multivariable calc

calc 3

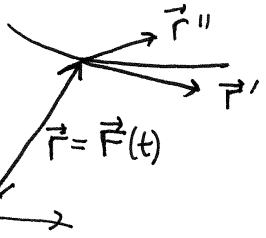
calc 1,2: $y=f(x)$

(13) curves

more dependent variables

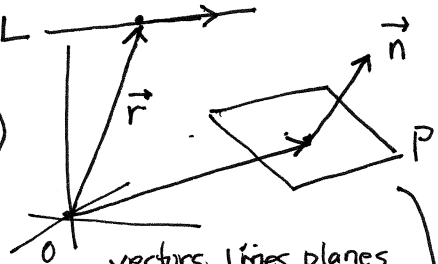
$\langle x(t), y(t), z(t)\rangle = \vec{r}(t)$

vector-valued function of 1-variable



$\int \vec{F}(t)\,dt$

(12)



vectors, lines, planes

linear functions

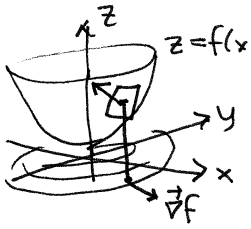
calc 1,2 $y=f(x)$

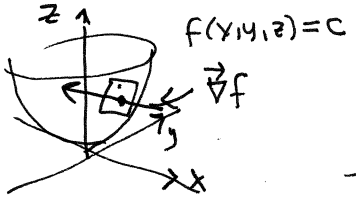
(14) more independent variables

$z=f(x,y)$

$w=f(x,y,z)=k$

surfaces

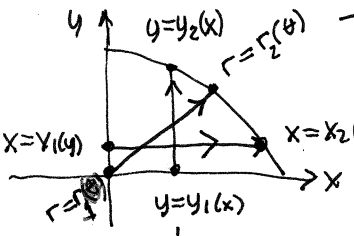




calc 2: $\int_{x_1}^{x_2} f(x)\,dx$

(15) parametrizing regions of the plane and space to integrate over them

$\iint_R f(x,y)\,dA$, $\iiint_E f(x,y,z)\,dV$

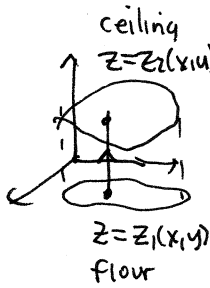


correction factor

$\int_{\theta_1}^{\theta_2}\int_{r_1(\theta)}^{r_2(\theta)} f(r\cos\theta, r\sin\theta)\underbrace{r\,dr\,d\theta}_{dA}$

$\int_{y_1}^{y_2}\int_{x_1(y)}^{x_2(y)} f(x,y)\,dx\,dy$

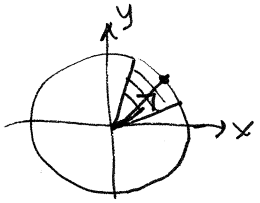
$\int_{x_1}^{x_2}\int_{y_1(x)}^{y_2(x)} f(x,y)\,dy\,dx$

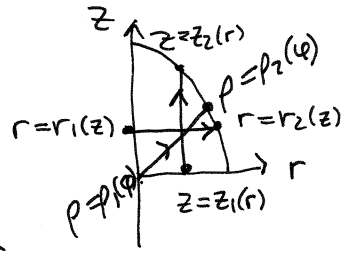


$\int_{z_1(x,y)}^{z_2(x,y)}\iint f(x,y,z)\,dz\,dA_{xy}$ → other permutations in order of integration →

2D in xy plane

cyl / sph coords:





$dV = r\,dz\,dr\,d\theta$

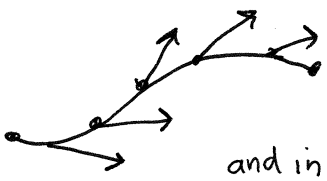
$= \rho^2\sin\varphi\,d\rho\,d\varphi\,d\theta$

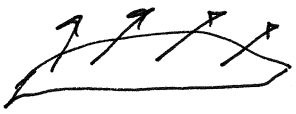
LAST STEP (16)

more ind and dep variables: vector fields along curves and surfaces

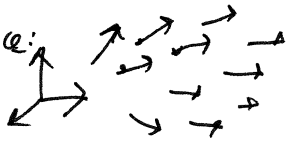
$\vec{F}(x,y) = \langle F_1(x,y), F_2(x,y)\rangle$

$\vec{F}(x,y,z) = \langle F_1(x,y,z), F_2(x,y,z), F_3(x,y,z)\rangle$





and in space:



and relating integrals & derivatives through Gauss's law and Stoke's Theorem

all aspects of calculus meet