LECTURE 25

Math 126

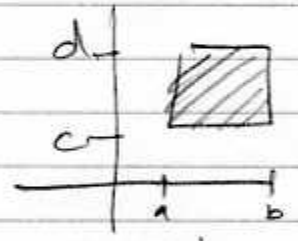
Final Exam : Comprehensive,
About 10 pages,
See online postings for practice finals.

Final Exam Review (Review in reverse)

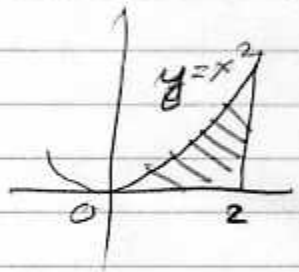
Ch. 15 Double Integrals

(1) By able to evaluate $\iint_D f(x,y)\,dA$

where D_1 = rectangle
D_2 = region between 2 curves
D_3 = region between circles



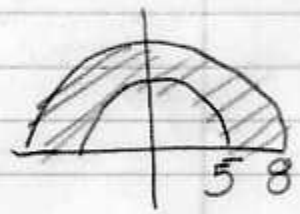
$a \le x \le b$
$c \le y \le d$



$0 \le x \le 2$
$0 \le y \le x^2$

or

$0 \le y \le 4$
$\sqrt{y} \le x \le 2$



Polar
$5 \le r \le 8$
$0 \le \theta \le \pi$
$x = r\cos(\theta)$
$y = r\sin(\theta)$
$dA = r\,dr\,d\theta$

Ch. 14 Surfaces

- Be able to compute partial derivatives.
- Find tangent plane, find linear approx, or find differential.

$$z = z_0 + f_x(x_0,y_0)(x-x_0) + f_y(x_0,y_0)(y-y_0)$$

$$z = f(x_0,y_0) + f_x(x_0,y_0)(x-x_0) + f_y(x_0,y_0)(y-y_0)$$

$$dz = \frac{\partial z}{\partial x}dx + \frac{\partial z}{\partial y}dy$$

Be able to use linear approx. to approximate values nearby

- Use second derivative test

① Find critical points
$f_x = 0 \quad f_y = 0$

② Classify them
$D = f_{xx} f_{yy} - [f_{xy}]^2$

$D>0$	$f_{xx}>0$	local min
$D>0$	$f_{xx}<0$	local max
$D<0$		saddle point

Ch. 13 Curves

$\vec{r}(t) = \langle f(t), g(t), h(t) \rangle$ = position in 3D

- $\vec{r}'(t)$ = a tangent vector = velocity vector
- $\vec{T}(t) = \frac{\vec{r}'(t)}{|\vec{r}'(t)|}$ = unit tangent vector

$\vec{N}(t) = \frac{\vec{T}'(t)}{|\vec{T}'(t)|}$ = principal unit normal vector

$\vec{B}(t) = \vec{T}(t) \times \vec{N}(t)$ = binormal

- $\vec{r}''(t)$ = acceleration vector

a_T = component projection of $\vec{r}''(t)$ on $\vec{T}$

a_N = " " " " " $\vec{N}$

$$a_T = \frac{\vec{r}'(t) \cdot \vec{r}''(t)}{|\vec{r}'(t)|} = \text{derivative of speed}$$

$$a_N = \frac{|\vec{r}'(t) \times \vec{r}''(t)|}{|\vec{r}'(t)|} = (\text{speed})^2 (\text{curvature})$$

- $K(t) = \text{curvature} = \frac{|\vec{T}'|}{|\vec{r}'|}$

$$= \frac{|\vec{r}'(t) \times \vec{r}''(t)|}{|\vec{r}'(t)|^3}$$