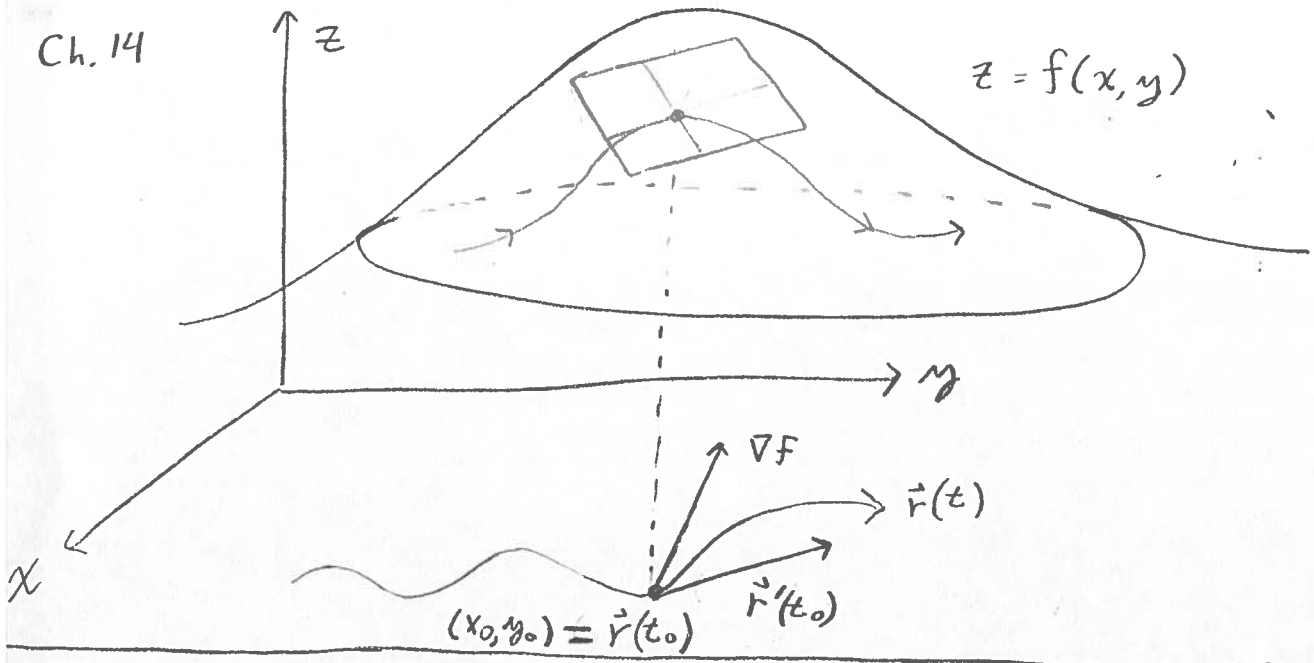
Ch. 14



Vectors: evaluate at (x_0, y_0)

→ normal to tangent plane: $\vec{n} = \langle f_x, f_y, -1 \rangle$

→ gradient: $\nabla f = \langle f_x, f_y \rangle$
(direction of max increase in z)

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

Scalars: evaluate at (x_0, y_0)

→ r.o.c. in z as x increases, y constant: $= f_x$

→ r.o.c. in z as y increases, x constant: $= f_y$

→ max r.o.c. in z: $= |\nabla f|$.

→ r.o.c. in z in direction $\vec{v}$: $D_{\vec{v}} f = \dfrac{\nabla f \cdot \vec{v}}{|\vec{v}|}$

Test 1 → r.o.c. in z w.r.t. t, along $\vec{r}(t)$: $\dfrac{dz}{dt} = \nabla f \cdot \vec{r}\,'$

Test 2 → $D = f_{xx} f_{yy} - (f_{xy})^2$

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

Lagrange multipliers

$f_x = c g_x$ | $f_y = c g_y$ | $g(x,y) = 0$

hor. tangent plane c.p.

$f_x = 0$ | $f_y = 0$