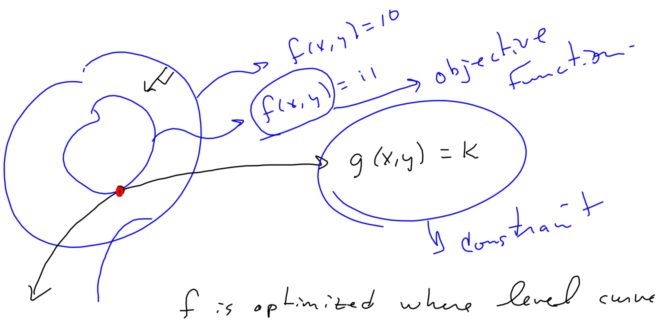

f is optimized where level curve of f is parallel to $g(x,y) = K$.

$\nabla f \parallel \nabla g$

∇f points in the direction of GREATEST INCREASE of f.

$\nabla f \parallel \nabla g \Longrightarrow$

$\nabla f = \lambda \nabla g$ for some real # λ.

Method:

Find all x, y, z, λ satisfying $\nabla f = \lambda \nabla g$

#s 3 - 17 Use lagrange multipliers to optimize *f*.

Optimize $f(x,y) = x^2+y^2$ Level curves are circles.

Subject to $g(x,y) = xy = 1$

$\nabla f = \langle f_x, f_y \rangle = \langle 2x, 2y \rangle$

$\nabla g = \langle y, x \rangle$

$\nabla f = \lambda \nabla g \Longrightarrow$

$2x = \lambda y \qquad 2y = \lambda x$

$\Longrightarrow \lambda = \frac{2x}{y} \Longrightarrow 2y = \left(\frac{2x}{y}\right)x = \frac{2x^2}{y}$

$\Longrightarrow 2y^2 = 2x^2$

$\Longrightarrow y^2 = x^2$

$\Longrightarrow y = \pm x$

But $xy = 1 \Longrightarrow x$ & y can't be opposite signs

So $y = x$

So $xy = 1$ & $x = y \longrightarrow x = 1 = y$ or $x = -1 = y$

$f(1,1) = 2$

$f(-1,-1) = 2$

Min @ both points because x^2+y^2 grows without bound

Maximiz $x+5y=F$ subject to

$2x+3y \le 6$

x	y
0	2
3	0

$0 \le 6$?
(0,0) Good

$3x-2y \le 6$

x	y
0	-3
2	0

$x \ge 0, y \ge 0$