Lagrange Multipliers

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

∇f

∇f

$x^2 + x^2 + x^2 = 27$

$xy + yz + xz = 27$

Ex $V = xyz$

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

$\langle yz, xz, xy \rangle = \lambda \langle y+z, x+z, y+x \rangle$

$x \cdot yz = \lambda(y+z) \cdot x$

$y \cdot xz = \lambda(x+z) \cdot y$

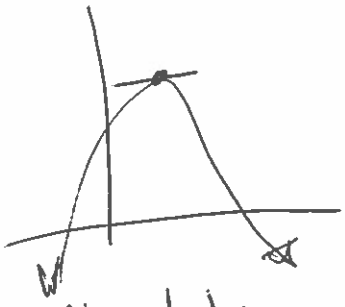
$z \cdot xy = \lambda(y+x) \cdot z$

$x\lambda(y+z) = y\lambda(x+z) = z\lambda(y+x)$

$xy\lambda + xz\lambda = xy\lambda + zy\lambda$

$x = y$ $\quad$ $y = z$

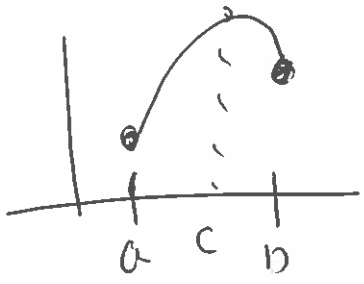
MAX / MINS



Absolute

Relate.

$f'(x)=0$



$f'(x)=0$

$f(a)$

$f(b)$

$f(c)$ – MAX

$f(x,y) =$

$A = x \cdot y$

$A(x,y) = xy$

Constraint.

Perimeter $= 1000'$

$2x + 2y = 1000$

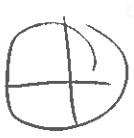
$y = \frac{1000 - 2x}{2}$

$A(x,y) = x\left(\frac{1000-2x}{2}\right)$

$f_x = 0,\ f_y = 0 \Rightarrow$ critical Points

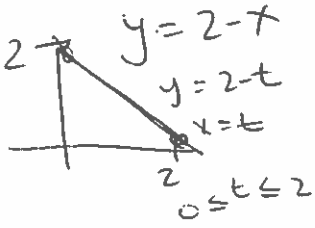
Finding MAX/mins over Region R

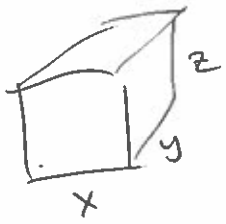
Parametrize the boundry for R



$x = \cos t$

$y = \sin t$





Surface Area = 54

$2xy + 2yz + 2xz = 54$

$V = (x,y,z) = V = xyz$

$z(2y+2x) = 54 - 2xy$

$$z = \frac{54 - 2xy}{2y+2x}$$

$$V(x,y) = xy\left(\frac{54-2xy}{2y+2x}\right) = \frac{54xy - 2x^2y^2}{2y+2x}$$

$$V_x = \frac{(2y+2x)(54y - 4xy^2)}{(2y+2x)^2} = 0$$

~~$y = x$~~

~~$y = 0$~~

$V_y =$

$54 - 4xy = 0$

$xy = \frac{54}{4}$

GROUP NAME: B.O	Student Names (First and Last)
Logo:	Speaker/Presenter: Shawnee
Date:	Writer/Prep: Piyush
Topics:	QC/Leader: Jaimes

Instructions:

GROUP NAME: 42	Student Names (First and Last)
Logo:	Speaker/Presenter:
Date:	Writer/Prep: Ben & Kyle
Topics:	QC/Leader: Gary

Instructions: $f(x,y,z) = x^2+y^2+z^2$ $\quad x+2y+4z = -15$, $y+z=0$

$\nabla f = \lambda \nabla g + \mu \nabla h$

$\langle 2x, 2y, 2z\rangle = \lambda\langle 1,2,4\rangle + \mu\langle 0,1,1\rangle = \langle -10,-20,-40\rangle + \langle 0,30,30\rangle$

$= \langle -10, 10, -10\rangle$

$\langle x,y,z\rangle = \langle -5, 5, -5\rangle$

$2x = \lambda$

$2y = 2\lambda + \mu$

$+ \quad 2z = 4\lambda + \mu$

$2y+2z = 6\lambda + 2\mu$

$0 = 3\lambda + \mu$

$x+2y+4z+15=0$

$x+2y-4y+15=0$

$x-2y+15=0$

$x-(2\lambda+\mu)+15=0$

$2x-4\lambda-2\mu+30=0$

$\lambda-4\lambda-2\mu+30=0$

$-3\lambda-2\mu+30=0$

$3\lambda+\mu+\mu=30$

$0+\mu=30$ $\quad \mu=30$

$0=3\lambda+\mu$

$0=3\lambda+30$

$\lambda=-10$

$x=-5$

$y=5$

$z=-5$

MAX: 75 MIN

GROUP NAME: Team 3P	**Student Names (First and Last)**
Logo:	**Speaker/Presenter:** Amanda Fowler
Date: 10/10/13	**Writer/Prep:**
Topics:	**QC/Leader:** Javier Blanco

Instructions:

$F(x,y)$ Constraint $(g(x,y) < c)$

$f(x,y) = 10x^2 y$ subject to $x^2 + y^2 \leq 3$ ← Constraint

$\nabla f = \lambda \nabla g$

$x^2 + y^2 - 3 = 0$

$\nabla f = \langle 20xy, 10x^2 \rangle$

$\nabla g = \langle 2x, 2y \rangle$

$x^2 + y^2 - 3 = 0$

$\langle 20xy, 10x^2 \rangle = \lambda \langle 2x, 2y \rangle$

$20xy = \lambda 2x$ $\quad \frac{20xy}{2x} = \lambda$ $\quad 10y = \lambda$

$10x^2 = \lambda 2y$ $\quad 10x^2 = 10y\, 2y$ $\quad \frac{10x^2}{10} = \frac{20y^2}{10}$

$x^2 = 2y^2$

$x = y\sqrt{2}$

$x^2 + y^2 - 3 = 0$

$(y\sqrt{2})^2 + y^2 - 3 = 0$

$2y^2 + y^2 - 3 = 0$

$3y^2 - 3 = 0$ $\quad y^2 = 1$

$10 = \lambda$

$x = \pm\sqrt{2}$

$y = \pm 1$

$\lambda = 0$

$\langle 20xy, 10x^2 \rangle = 0$

$\langle 0, y \rangle$ ~~MAX~~

$(\pm\sqrt{2}, \pm 1)$

MAX 20

MIN -20

GROUP NAME:	Student Names (First and Last)
Logo:	Speaker/Presenter: _____
Date:_____	Writer/Prep: D.
Topics:	QC/Leader:_____

Instructions:

(2,6) (2,6)
(-2,-6) (-2,6)
(

MAX: 72
MIN: -72