“QUIZ” for Lecture 11

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E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q11FirstLast.pdf) ASAP BUT NO LATER THAN Oct. 12, 8:00pm Deadline extended to Oct. 17

1. Use Largange multipliers (no credit for other methods) to find the **smallest** value that $x+y+z$ can be, given that $xyz = 125$

when $f(x,y,z) = x+y+z$

and $g(x,y,z) = xyz = 125$

$\nabla f = \langle 1,1,1 \rangle$

$\nabla g = \langle yz, xz, xy \rangle$

$1 = \lambda yz,\ 1 = \lambda xz,\ 1 = \lambda xy,\ xyz = 125$

$1 = \lambda^3 (xyz)^2$

$x = \sqrt{\frac{1}{\lambda}}$ $y = \sqrt{\frac{1}{\lambda}}$ $z = \sqrt{\frac{1}{\lambda}}$

$\left(\sqrt{\frac{1}{\lambda}}\right)^3 = 125$ $\lambda = \frac{1}{25}$

$x = \sqrt{\frac{1}{\frac{1}{25}}} = \pm 5,\ y = \pm 5,\ z = \pm 5$

$f(5,5,5) = 5+5+5 = 15$

$f(-5,-5,-5) = -5-5-5 = -15$

Smallest value: -15

2. Use Largange multipliers (no credit for other methods) to find the **largest** value that xyz can be, given that $x+y+z = 15$

when $f(x,y,z) = xyz$

and $g(x,y,z) = x+y+z = 15$

$\nabla f = \langle yz, xz, xy \rangle$

$\nabla g = \langle 1, 1, 1 \rangle$

$yz = \lambda,\ xz = \lambda,\ xy = \lambda$

$(xyz)^2 = \lambda^3$

$(x\lambda)^2 = \lambda^3$ $x^2\lambda^2 = \lambda^3$ $x^2 = \lambda$ $x = \sqrt{\lambda}$

$y = \sqrt{\lambda}$ $z = \sqrt{\lambda}$

$\sqrt{\lambda} + \sqrt{\lambda} + \sqrt{\lambda} = 15$

$3\sqrt{\lambda} = 15$

$\sqrt{\lambda} = 5$ $\lambda = 25$

$x = \sqrt{25} = \pm 5,\ y = \pm 5,\ z = \pm 5$

$f(5,5,5) = 125$

$f(-5,-5,-5) = -125$

Largest Value: 125