"QUIZ" for Lecture 11

NAME: (print!) Aayushi Kasera **Section:** _____

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 $xyz = 125$

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

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

$g(x) = xyz$

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

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

$(xyz)^2$

$\frac{1}{\lambda^{3/2}} = 125$

$\frac{1}{5} = \sqrt{\lambda}$

$\lambda = \frac{1}{25}$

$yz = 25$ $xy = 25$

$xz = 25$ $z = 25/y$, $x = 25/y$

$\frac{25^2}{y^2} = 25$

$y = \pm 5$

$x = \pm 5$

$z = \pm 5$

smallest value $\rightarrow (-5, -5, -5)$

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

$f(x) = xyz$

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

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

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

$x = \frac{\lambda}{y}, \quad z = \frac{\lambda}{y}$

$xz = \lambda$

$\frac{\lambda^2}{y^2} = \lambda$

$\lambda = y^2$

$yz = \lambda$

$yz = y^2$

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

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

$$3\sqrt{\lambda} = 15$$

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

Largest $= (5, 5, 5)$