"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 $xyz = 125$

$f_x = 1$
$f_y = 1$
$f_z = 1$

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

$\nabla f = \lambda \nabla g$

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

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

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

$1 = (125)^2 \lambda^3$

$\frac{1}{(125)^2} = \lambda^3$ $\quad \lambda = \frac{1}{25}$

$g_x = yz$
$g_y = xz$
$g_z = xy$

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

$\frac{1}{x^2 \lambda^2} = 1$

$x = 5$
$z = 5$
$y = 5$

$\langle 5, 5, 5 \rangle$

$x+y+z =$

$\boxed{15}$

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

$f_x = yz$
$f_y = xz$
$f_z = xy$

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

$g_x = 1$
$g_y = 1$
$g_z = 1$

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

$\nabla f = \lambda \nabla g$

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

$yz = \lambda \quad y = \frac{\lambda}{z}$
$xz = \lambda \quad z = \frac{\lambda}{x}$
$xy = \lambda \quad x = \frac{\lambda}{y}$
$x+y+z = 15$

$\frac{x\lambda + z\lambda}{xz}$ $\quad \frac{xy\lambda + zy\lambda + xz\lambda}{xyz} = 15$

$x \cdot y \cdot z =$

$\boxed{125}$

$3\lambda^2 = 15xyz$
$3\lambda^2 = 15\lambda^3 x$
$\frac{1}{5}\lambda = x$
$\lambda = 15$

$z = 5 \quad x = 5$
$y = 5$