"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

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

$\nabla f = \langle 1,1,1 \rangle \quad \nabla g = \langle yz, xz, xy \rangle$

$1 = \lambda yz \quad x = \frac{1}{z\lambda} \qquad \frac{z}{z\lambda} + \frac{1}{x\lambda} = 125$

$1 = \lambda xz \quad y = \frac{1}{y\lambda} \qquad \frac{2x}{xz\lambda} + \frac{z}{xz\lambda} = 125$

$1 = \lambda xy \quad z = \frac{1}{xy}$

$2xz = 125$

$xz = \frac{125}{2}$

$\frac{1}{\lambda} = \frac{125}{2}$

$\lambda = \frac{2}{125} \rightarrow \frac{2yz}{125} + \frac{2xz}{125} + \frac{2xy}{125} = max \rightarrow \quad 1+1+1 = \boxed{3}$

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

$\nabla f = \langle yz, xz, xy \rangle \quad \nabla g = \langle 1,1,1 \rangle$

$yz = 1\lambda$
$xz = 1\lambda$
$xy = 1\lambda$
$\rightarrow \quad x = \frac{\lambda}{z}, \; y = \frac{\lambda}{z}, \; z = \frac{\lambda}{x} \rightarrow \frac{2\lambda}{z} + \frac{\lambda}{x} = 15 \qquad \frac{2x\lambda}{xz} + \frac{z\lambda}{xz} = 15$

$\frac{2x\lambda + z\lambda}{xz} = 15 \rightarrow 15xz = \lambda(2x+z) \rightarrow \lambda = \frac{15xz}{2x+z}$

$\lambda = 25!$

$yz = 25$
$xz = 25$
$xy = 25$
$\rightarrow \quad x = \frac{25}{z}, \; y = \frac{25}{z}, \; z = \frac{25}{x}$

$x = 5, \; y = 5, \; z = 5$

$f(5,5,5) = \boxed{125!}$