

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

$$f \Delta (x+y+z) = (1, 1, 1)$$

$$g \Delta (xyz=125) = (yz, xz, xy)$$

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

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

$$xyz = 125$$

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

$$\lambda yz = \lambda^3 yz \cdot yz x^2$$

$$\lambda yz = \lambda yz \cdot \lambda yz \cdot \lambda x^2$$

$$1 = \lambda x^2$$

$$\rightarrow \frac{1}{\lambda} = x^2 \quad x = \sqrt{\frac{1}{\lambda}}$$

$$\lambda xz = \lambda xz \cdot \lambda xz \cdot \lambda y^2$$

$$1 = \lambda y^2$$

$$\frac{1}{\lambda} = y^2 \rightarrow y = \sqrt{\frac{1}{\lambda}}$$

\* z will be the same \*

$$\sqrt{\frac{1}{\lambda}} \cdot \sqrt{\frac{1}{\lambda}} \cdot \sqrt{\frac{1}{\lambda}} = 125$$

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

$$x = y = z = \sqrt[3]{\frac{1}{\lambda}} = 5$$

$$P(5, 5, 5)$$

$$\boxed{5+5+5=15}$$

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

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

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

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

$$f \Delta = (yz, xz, xy)$$

$$g \Delta = (1, 1, 1)$$

all same work as #1

$$\rightarrow x = y = z = \sqrt[3]{\frac{1}{\lambda}} = 5$$

$$5+5+5=15$$

$$P(5, 5, 5)$$

$$\boxed{5 \cdot 5 \cdot 5 = 125}$$

Not sure what it means to only have one value