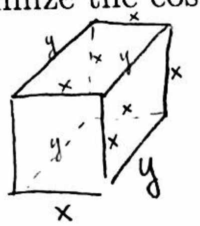
Quiz 16

March 30, 2016

For the function $f(x, y)$ subject to the constraint $g(x, y) = c$, the Lagrange equations are $f_x = \lambda g_x$, $f_y = \lambda g_y$, and $g(x, y) = c$.

1. ***Set up*** the optimization and constraint functions for the following problem. (Your answer should look like this: Minimize ________ subject to ________.)

   A rectangular building with a square front is to be constructed of materials that costs 16 dollars per ft^2 for the flat roof, 19 dollars per ft^2 for the sides and the back, and 15 dollars per ft^2 for the glass front. We will ignore the bottom of the building. If the volume of the building is 5,600 ft^3, what dimensions will minimize the cost of materials?



$\text{Cost} = 16(xy) + 19(2xy + x^2) + 15(x^2)$

$V = 5600 = x^2 y$

$\boxed{\text{Minimize } 54xy + 34x^2 \text{ subject to } x^2y = 5600}$

2. Find the point (x, y) which maximizes $8x^{3/2}y^{1/2}$ subject to $x + y = 208$.

$$\begin{cases} 12x^{1/2}y^{1/2} = \lambda \\ 4x^{3/2}y^{-1/2} = \lambda \\ x + y = 208 \end{cases}$$

$12x^{1/2}y^{1/2} = 4x^{3/2}y^{-1/2}$

$12y = 4x$ OR $x = 0$ OR $\cancel{y = 0}$

$x = 3y$

$(3y) + y = 208$

$y = 52$

$x = 156$

(x, y)	$f(x, y)$
$\boxed{(156, 52)}$	112,403.17
$(0, 208)$	0