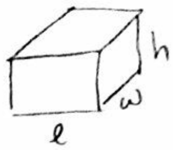
Quiz 15

March 25, 2016

1. ***Set up*** the function of *two* variables that you would minimize to solve the problem below:
We are tasked with constructing a rectangular box with a volume of 13 cubic feet. The material for the top costs 8 dollars per square foot, the material for the 4 sides costs 6 dollars per square foot, and the material for the bottom costs 13 dollars per square foot. To the nearest cent, what is the minimum cost for such a box?



Minimize $C = 8(\ell w) + 6(2\ell h + 2wh) + 13(\ell w)$

$= 21\ell w + 12\ell h + 12wh$

Know $V = 13 = \ell w h$, so $\ell = \frac{13}{wh}$ OR $h = \frac{13}{\ell w}$

$C = 21\left(\frac{13}{wh}\right)w + 12\left(\frac{13}{wh}\right)h + 12wh$ $\boxed{C = 21\ell w + 156/w + 156/\ell}$

$= \boxed{273/h + 156/w + 12wh}$ OR $w = \frac{13}{\ell h} \rightarrow \boxed{C = 273/h + 12\ell h + 156/\ell}$

2. Find the critical points (u, v) of $g(u, v) = -7u^2v + 252uv - 9v^2$.

$g_u = -14uv + 252v \overset{set}{=} 0 \longrightarrow v(-14u + 252) = 0$

$g_v = -7u^2 + 252u - 18v \overset{set}{=} 0$ $v = 0$ OR $u = 18$

If $v = 0$, $g_v = -7u^2 + 252u = u(-7 + 252u) = 0 \Rightarrow$ $u = 0$ or 36

If $u = 18$, $g_v = -2268 + 4536 - 18v = 0$

$18v = 2268$

$v = 126$

Critical Points: $\boxed{(0,0),\ (36,0) \text{ and } (18,126)}$