Math 234 Discussion Worksheet - Oct 28

1. Consider a rectangular box of surface area 6.
(a) What is the largest possible volume of such a rectangular box?
(b) What is the smallest possible total length of the edges?

2.* What is the largest possible area of a triangle of perimeter 3?
(*Hint:* $A = \sqrt{s(s-a)(s-b)(s-c)}$ *where* $s = (a+b+c)/2$.)

1. (a) Maximize $V = xyz$ subject to the constraint

$$2xy + 2yz + 2zx = 6.$$

Using Lagrange multiplier one should get $x = y = z = 1$, and so $\boxed{V_{max} = 1}$.

1. (b) Minimize $L = 4x + 4y + 4z$ subject to the constraint

$$2xy + 2yz + 2zx = 6.$$

Using Lagrange multiplier one should get $x = y = z = 1$, and so $\boxed{L_{min} = 12}$.

2. Note that $s = 3/2$ is a constant. Let $x = s - a$, $y = s - b$, $z = s - c$. Then the problem is the same as maximizing

$$A^2 = \frac{3}{2}xyz$$

subject to the constraint

$$x + y + z = \frac{3}{2}.$$

Using Lagrange multiplier one should get $x = y = z = \frac{1}{2}$, and so $\boxed{A_{max} = \frac{\sqrt{3}}{4}}$.