

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation when appropriate). Indicate where technology is used and what type (Maple, GC).

a) The girth of a rectangular package with smallest dimensions x and y is the cross-sectional perimeter of $2(x + y)$. The sum of this plus the longest dimension z must be less than or equal to 9ft to be mailed by the USPS. What are the dimensions and volume of the largest package that has the US Postal Service maximum of a 9 ft girth plus length? Identify the objective function and constraint and then describe the domain of the volume function $V(x, y)$ obtained by using the constraint to eliminate z (draw a diagram of this domain, identifying its edges) and confirm that your result is a local maximum of that function using the second derivative test. Locate your critical point in your diagram.

[HINT: The partial derivatives factor, making it easy to solve the relevant equations. Check with Maple.]

Finally answer the word problem with a complete English sentence describing completely your result, and give the result for the dimensions in inches as well as ft.

b) For the mathematical function $V(x, y)$, identify the remaining critical points and classify them as local max/min or saddle points.

► **solution**