Please answer the following questions completely and clearly. An unsupported answer is worth few points.

(1) Consider the function \( f(x, y) = 4y\sqrt{x} \), find the maximum rate of change and the direction it occurs in at the point \((4, 1)\).

(2) Find three positive numbers which sum to 100 and whose product is maximum (Hint: Rewrite \(x + y + z = 100\) to eliminate \(z\)).