The formula for the covariant vector transformation from the R^2 coordinate system to the B coordinate system is:

$$V_m^{(B)} = \frac{\partial x^n}{\partial y^m} V_n^{(R^2)}$$

For our example, the vector $\acute{V} = x^2 e_1 + y^2 e_2$, where e_1 and e_2 are the basis for R^2.

Our new coordinate system $B = f(e_1, e_2)$; spanned by

$$b_1 = 2e_1 + 2e_2$$

$$b_2 = e_2$$

To find V_1 in the B basis in terms of V_i in R^2:

$$V_1^{(B)} = \frac{\partial e^i}{\partial b^1} V_i^{(R^2)}$$

$$V_1^{(B)} = \frac{\partial e^1}{\partial (2e_1 + 2e_2)} x^2 + \frac{\partial e^2}{\partial (2e_1 + 2e_2)} x^2$$

$$V_1^{(B)} = 2x^2 + 2y^2$$