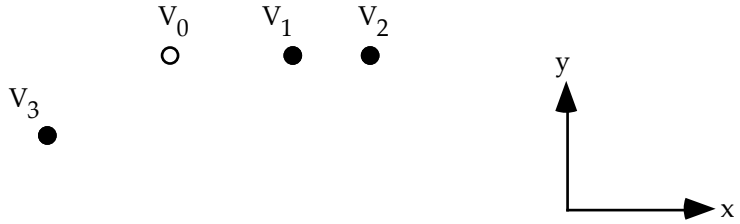
PROBLEM SET 2
Simple Kriging

1. Given the three measurements of elevation of land surface (V_1, V_2, and V_3), use simple kriging to estimate the elevation V_0 and the variance of this estimate.



Measured values and coordinates (with respect to an origin at V_0) are:

	Elevation (ft above msl)	x coordinate	y coordinate
V_1	10	300	0
V_2	100	500	0
V_3	15	-300	-200

The estimated mean elevation (m) in this area is 40 ft and the estimated variance (σ^2) is 10 ft^2. Assume a variogram structure based on the omnidirectional "spherical" model given below.

$$\gamma(h) = \begin{cases} 0 & \text{if } h = 0 \\ \sigma^2\left[1.5\frac{h}{a} - .5\left(\frac{h}{a}\right)^3\right] & \text{if } 0<h<a \\ \sigma^2 & \text{if } h \geq a \end{cases}$$

where a is the variogram range and h is distance. The range of correlation (a) has been estimated to be 600 ft.

(a) Plot this variogram model and the corresponding covariance model.

(b) Write the simple kriging system of equations (use covariances [C_{ij}] instead of variogram values). Please also show these equations in matrix form.

(c) Does your estimated value of V_0 make sense? Are any of the weights negative? If so, briefly explain why.

(d) True or false: The kriging weights do not depend on the actual data values (V_i). Explain.

2. Show that if the variogram model were a pure nugget effect, the simple kriging estimate of V_0 would be 40.

3. If the variogram model were a pure nugget effect, what would the ordinary kriging estimate of V_0 be?