Vector Fields and Line Integrals

1. (a) Find the gradient field of $f(x, y) = x^2 - y$.
   (b) Sketch the above gradient field.

2. Find the work done by the field

$$\mathbf{F}(x, y, z) = x \sin(y)\mathbf{i} + y\mathbf{j} + x\mathbf{k}$$

   in moving a particle along the path (t, t^2, t^3), $-1 \leq 0 \leq 1$.