1. Let $\mathbf{F} = \langle yz, xz, xy \rangle$. Compute the integral
$$\int_C \mathbf{F} \cdot ds$$
for the curve $C(t) = \langle 3t^2 + \cos(\pi t^3), 2t, t^4 + t^3 - t + 1 \rangle$ for $t = 0$ to $1$. Hint: Is $\mathbf{F}$ conservative?

2. Determine whether or not the following vector fields are conservative. If they are conservative, find a potential function.
   
   (a) $\mathbf{F} = \langle y^2, x^2, \sin(z) \rangle$.
   (b) $\mathbf{G} = \langle 3x^2 + \sin(z), 2yz, y^2 + x\cos(z) \rangle$. 
3. Let $f(x, y, z) = 9z + 2x$ and let $C$ be the curve $c(t) = \langle t, t^2, t^3 \rangle$ for $t = 0$ to 1. Compute

$$\int_C f(x, y, z) \, ds.$$