Extra problemset 2, MATH 550

(1) Find a potential for $\mathbf{F} = (y + z\cos xz)\mathbf{e_1} + x\mathbf{e_2} + (x\cos xz)\mathbf{e_3}$.

(2) Let $\mathbf{F} = 2xy\mathbf{e_1} + (x^2 + z)\mathbf{e_2} + y\mathbf{e_3}$.
    (a) Show that $\mathbf{F}$ is conservative.
    (b) Compute $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C is a smooth curve connecting the point $(1, 1, 1)$ with the point $(1, -1, 2)$.