3. (10 pts) Let $\mathbf{F}(x,y,z) = (2xz + e^y)\mathbf{i} + xe^y\mathbf{j} + (x^2 + 3z^2)\mathbf{k}$

   a. (6 pts) Find a function f such that $\mathbf{F} = \nabla f$. (In other words, find a potential function for $\mathbf{F}$)

   b. (4 pts) Evaluate $\int_C \mathbf{F} \cdot \mathbf{dr}$

   where C is the curve given by $\mathbf{r}(t) = t\mathbf{i} + \cos(t)\mathbf{j} + \sin(t)\mathbf{k}$, $0 \le t \le \pi$
   (Hint: There are several ways of evaluating this, ranging from easy to hard. Pick wisely.)