1. Find the gradient field corresponding to $f$, $f(x, y, z) = \sqrt{x^2 + y^2 + z^2}$. 
2. Evaluate $\int_{R} (y + 3x)^2 dA$, where $R$ is bounded by $y = 1 - 3x, y = 3x, y = x - 1, \text{and } y = x - 3$. 
3. (a): Evaluate $\int_C 3x \, ds$, where $C$ is the line segment from $(0, 0)$ to $(1, 0)$, followed by the quarter circle to $(0, 1)$;
(b): Evaluate $\int_C 2x \, dx$, where $C$ is the quarter circle $x^2 + y^2 = 4$ from $(2, 0)$ to $(0, 2)$.
4. Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y, z) = (z, y, 0)$, $C$ is the line segment from $(1, 0, 2)$ to $(2, 4, 2)$. 
5. $F(x, y) = (x^2 + 1, y^3 - 3y + 2)$
   (a): Find a function $f$ such that $F = \nabla f$;
   (b): Evaluate $\int_C F \cdot dr$, where $C$ is the top half circle from $(-4, 0)$ to $(4, 0)$. 