

The University of Calgary
Department of Mathematics and Statistics
MATH 353 Handout #4 Solution

1. Given $\mathbf{F}(x, y, z) = (3x^2yz, kyz + x^3z, x^3y + 1 + y^2)$.
 - (a) Find the value of k so that the field \mathbf{F} is conservative.
 - (b) Then, find a potential of \mathbf{F} .

2. Evaluate $\int_c f \, ds$ where $f(x, y, z) = z^2$ and c is the part of the line of intersection of two planes;
 $x + y - z = 1$ and $2x + y - 3z = 0$ between the xy -plane and the point $D(3, 0, 2)$.

3. For $\mathbf{F}(x, y) = (ky^2 + x, xy - \frac{1}{\sqrt{y}})$ find the value for k
so that the field is conservative, then find a potential.

4. Evaluate $\int_c z \, ds$ and c is the intersection of the plane $z - y = 1$ and
the paraboloid $0 = x - y^2$ between $A(1, -1, 0)$ and $B(0, 0, 1)$.

5. Find $\int_c \mathbf{F} \cdot d\mathbf{s}$ where $\mathbf{F}(x, y, z) = (z, e^{\frac{y}{x}}, 2x)$ is given by $\mathbf{r}(t) = (t, t^2, e^t)$, $t \in [1, 2]$.

6. For $\mathbf{F}(x, y) = (3x\sqrt{x^2 + y^4} + \cos x, ky^3\sqrt{x^2 + y^4} + \sin y)$ find the value for k
so that the field is conservative, then find a potential.

7. Evaluate $\int_c z \, ds$ and c is given by $\mathbf{r}(t) = (t \cos t, t \sin t, t)$, $t \in [0, 1]$.

8. Find $\int_c \mathbf{F} \cdot d\mathbf{s}$ where $\mathbf{F}(x, y, z) = (y, z, 2x - z)$ and c is the intersection
of the plane $z = 2x$ and the paraboloid $z = x^2 + y^2$ oriented counterclockwise.