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 vertical surface $0 = x - y^2$ 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.