MATH2153 Test Vector Fields Date \_\_\_\_\_ /\_\_\_\_\_ /\_\_\_\_\_\_\_\_\_\_\_

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. For the vector field
2. Compute the line integral where .

Solution

At first we need the vector field along the curve C

Next we need the derivative of the parameterization

Use the formula

The line integral is then

Find integral separately:

Then

**Answer**:

1. determine if *F* is conservative or not;

Solution

Suppose that .

If we temporarily hold *z* constant, then is a function of *x* and *y,* that

Likewise, holding *y* constant, that

With *x* constant we get

As

then *F* is conservative.

**Answer: *F* is conservative.**

1. find a potential function for *F*.

Solution

From a condition it is known the following equalities:

where *f* is the potential function for *F*.

Integrate the first one with respect to *x*.

Now, we can differentiate this with respect to *y*

then

and

Differentiate with respect to *z* and set the result equal to condition.

So,

The potential function for this vector field is then,

**Answer:**

1. Use the Fundamental Theorem of Line Integral to evaluate , where

.

Solution

Use the Fundamental Theorem of Line Integral

As

then

**Answer:**