

```
BeginPackage["ArealIntegrate`", "Global`"]
```

ArealIntegrate::usage="ArealIntegrate[z, {x, y}, nodes]
yields the numerical value of z, a function of {x,y}
coordinates, integrated within
nodes."

```
Begin["`Private`"]
```

```
Clear[IntegrateApart];
```

```
IntegrateApart[x_, t_Symbol] := Module[{z},  
  z = Apart[x, t];  
  If[Head[z] === Plus,  
    Plus@@Map[Integrate[#, t]&, List@@z],  
    Plus@@Map[Integrate[#, t]&, Replace[z,  
      Plus[y_] -> List[y]] ] ]  
]
```

```
IntegrateApart[x_, {t_Symbol, t1_, t2_}] :=(  
  (# /. t -> t2) - (# /. t -> t1))&[  
    IntegrateApart[x, t]]
```

```
Clear[ArealIntegrate, LineIntegrate];
```

```
ArealIntegrate[z_, {x_, y_}, nodes_] := Module[  
  {zx, t, segments},  
  zx = IntegrateApart[z, x];  
  segments = Partition[Append[nodes, nodes[[1]]], 2, 1];  
  Plus@@Map[LineIntegrate[zx, {x, y, t}, #]&,  
    segments]]
```

```
LineIntegrate[z_, {x_, y_, t_},  
  {{x1_, y1_}, {x2_, y2_}}] := (IntegrateApart[  
  ((y2 - y1) z) /. {x -> x1 + t(x2 - x1), y -> y1 + t(y2 - y1)},  
  {t, 0, 1}])
```

```
End[]
```

```
EndPackage[]
```