```
>> syms x y z t u v
>> x=sin(2*t)

x =

sin(2*t)

>> y=cos(2*t)

y =

cos(2*t)

>> z=3*t

z =

3*t

>> r=[x y z]

r =

[ sin(2*t), cos(2*t), 3*t]
>> diff(r,t)

ans =

[ 2*cos(2*t), -2*sin(2*t), 3]

>> diff(x,t)

ans =

2*cos(2*t)

>> ans^2

ans =

4*cos(2*t)^2

>> xprime=diff(x,t)

xprime =

2*cos(2*t)
```

```
>> yprime=diff(y,t)

yprime =

-2*sin(2*t)

>> zprime=diff(z,t)

zprime =

3

>> mag=sqrt(xprime^2+yprime^2+zprime^2)

mag =

(4*cos(2*t)^2 + 4*sin(2*t)^2 + 9)^(1/2)

>>
>> mag=sqrt(13)

mag =

   3.6056

>> int(mag,t,0,2*pi)

ans =

2*pi*13^(1/2)

>> syms x y z
>> f=13+x^2-y^2

f =

x^2 - y^2 + 13

>> F=f-z

F =

x^2 - y^2 - z + 13

>> fx=diff(F,x)

fx =
```

2*x

```
>> fy=diff(F,y)

fy =

-2*y

>> fz=diff(F,z)

fz =

-1

>> mag=sqrt(fx^2+fy^2+fz^2)

mag =

(4*x^2 + 4*y^2 + 1)^(1/2)

>> syms r theta
>> mag=sqrt(4*r^2+1)

mag =

(4*r^2 + 1)^(1/2)

>> int(int(mag*r+0*theta,r,0,2),theta,0,2*pi)

ans =

(pi*(17*17^(1/2) - 1))/6

>> syms u v
>> ru=[v*cos(u) -v*sin(u) v]

ru =

[ v*cos(u), -v*sin(u), v]

>> rv=[sin(u) cos(u) u]

rv =

[ sin(u), cos(u), u]

>> cross(ru,rv)
```

ans =

[- v*cos(u) - u*v*sin(u), v*sin(u) - u*v*cos(u), v*cos(u)^2 + v*sin(u)^2]

>>