```
%Problem 1a
ezplot3('2+cos(3*t/2)*cos(t)','2+cos(3*t/2)*sin(t)','sin(3*t/2)',[0,4*pi])
```


$x = 2+\cos(3\ t/2)\cos(t),\ y = 2+\cos(3\ t/2)\sin(t),\ z = \sin(3\ t/2)$
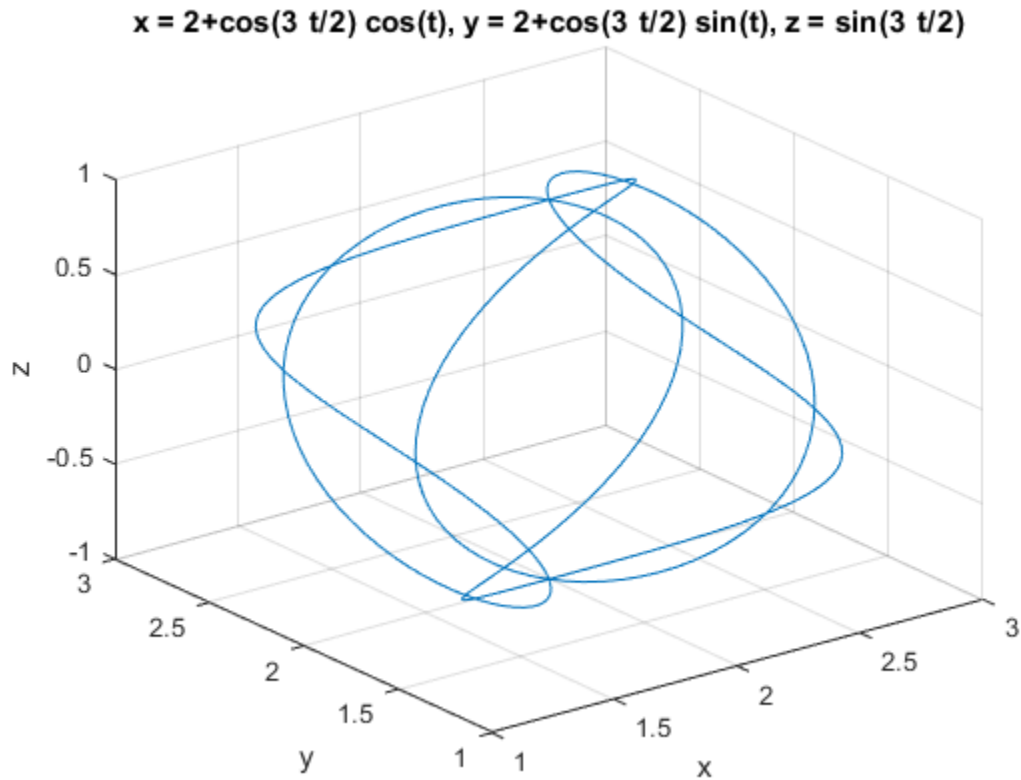
```
%Problem 1b
P=[1,2,-1];
Q=[3,-2,1];
R=(Q-P)
syms t
line = P + (t*R);
ezplot3(line(1),line(2),line(3))
hold on
plot3(1,2,-1,'o')
plot3(3,-2,1,'o')
hold off
```

R =

*   2   -4   2*

x = 2 t + 1, y = 2 - 4 t, z = 2 t - 1
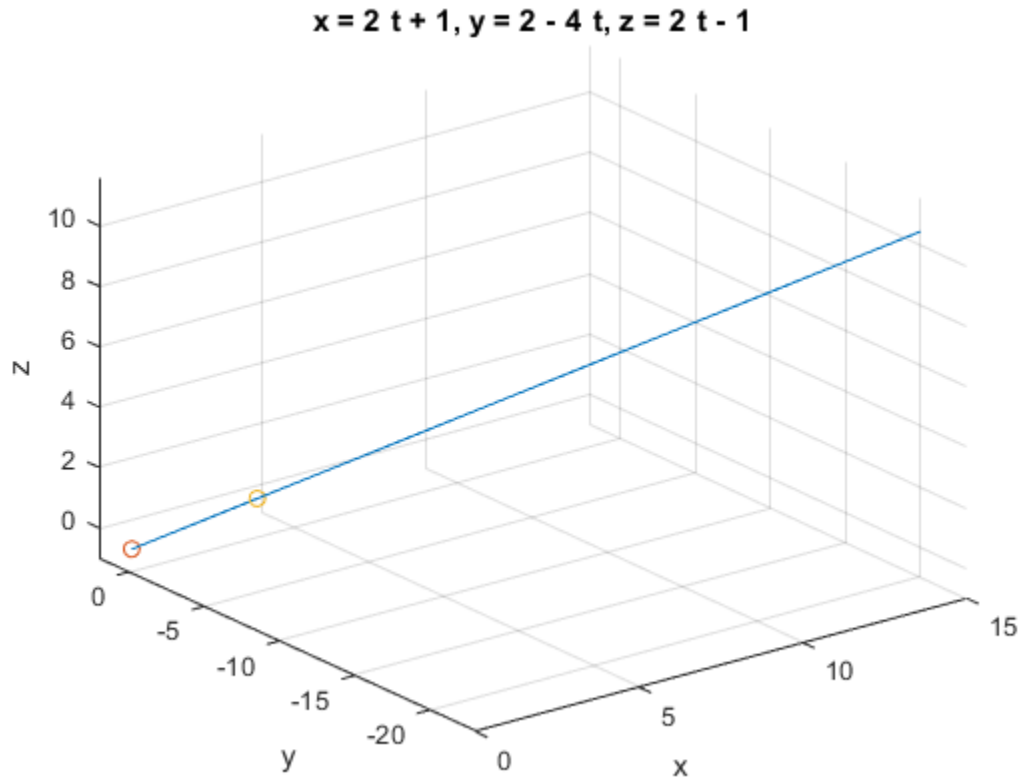

```
syms t
%Problem 2a
r = [(t/pi)-sin(t),1-cos(t),sin(t)];
%Problem 2b
rdiff = [diff(r(1)),diff(r(2)),diff(r(3))];
rtan = subs(rdiff,pi);
rutan = rtan/norm(rtan)
%Problem 2c
rnorm = diff(rdiff);
rnorms = subs(rnorm,pi);
runorms = rnorms/norm(rnorms)
dot(runorms,rutan)
%Problem 2d
ezplot3(r(1),r(2),r(3),[0,2*pi])
hold on
quiver3(subs(r(1),pi),subs(r(2),pi),subs(r(3),pi),rutan(1),rutan(2),rutan(3))
quiver3(subs(r(1),pi),subs(r(2),pi),subs(r(3),pi),runorms(1),runorms(2),runor
ms(3))
hold off
```

rutan =

[(1/pi + 1)/((1/pi + 1)^2 + 1)^(1/2), 0, -1/((1/pi + 1)^2 + 1)^(1/2)]
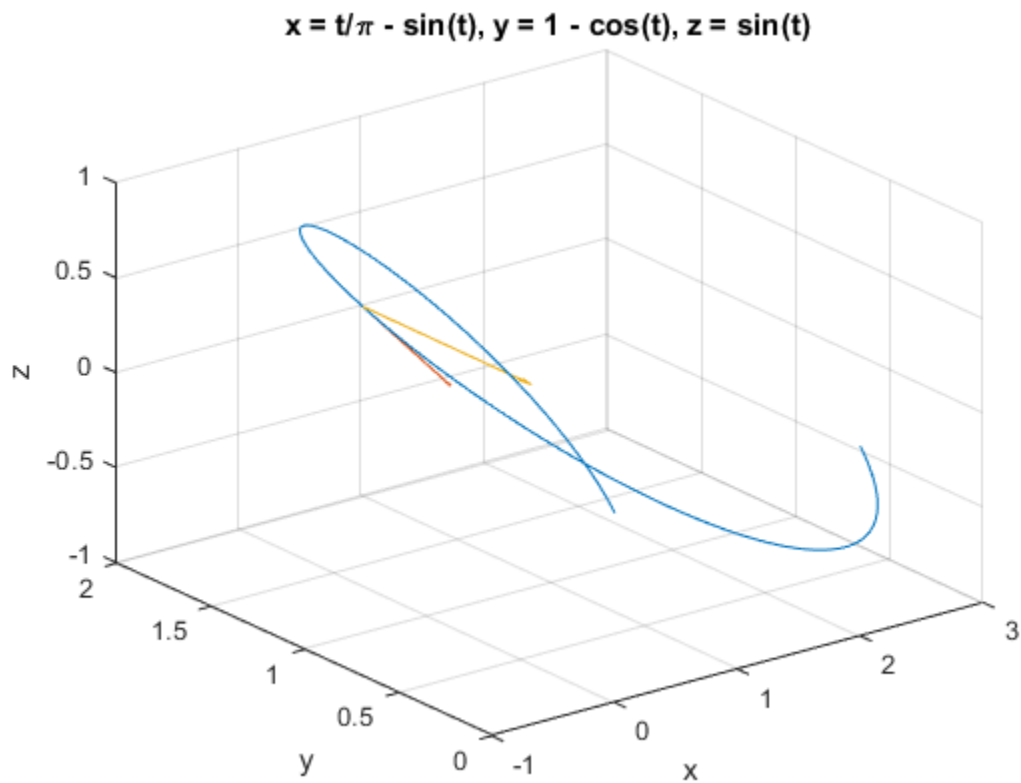
runorms =

[0, -1, 0]

ans =

0

x = t/π - sin(t), y = 1 - cos(t), z = sin(t)


```
syms t
%Problem 3a
pos = [(t^2)*(exp(t)),sin(2*t)-(t^6),-log(t)*cos(t)];
vel = diff(pos);
double (subs(vel,1))
speed = norm(vel);
double(subs(speed,1))
acc = diff(vel);
double(subs(acc,1))
```

ans =

8.1548   -6.8323   -0.5403

ans =

```
    10.6524


ans =

    19.0280   -33.6372     2.2232
```

```matlab
%Problem 3b

acctan = (dot(vel,acc))/(speed);
acctan1 = subs(acctan,1);
accnorm = (norm(cross(vel,acc)))/norm(vel);
accnorm1 = subs(accnorm,1);
double(accnorm1)
double(acctan1)
```
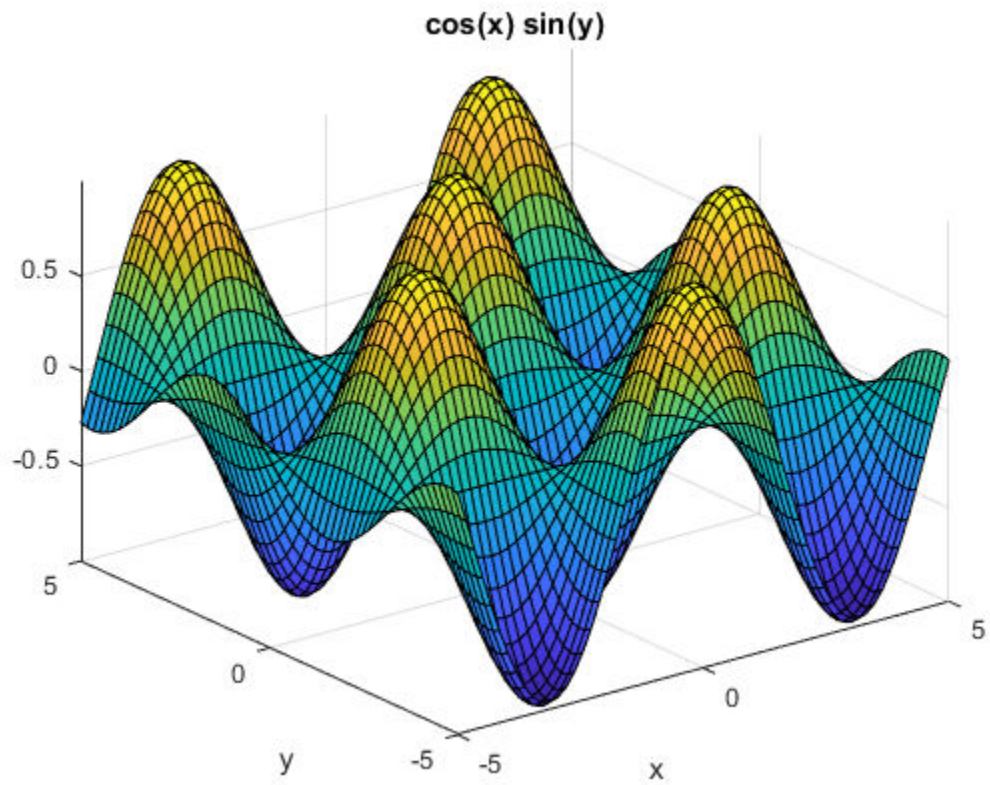
```
ans =

    14.1572


ans =

    36.0283
```

```matlab
syms t
%Problem 4
p4r = [t*cos(t),t,t*sin(t)];
p4 = sqrt((diff(p4r(1)))^2 + (diff(p4r(2)))^2 + (diff(p4r(3)))^2);
double(int(p4,0,4*pi))
```
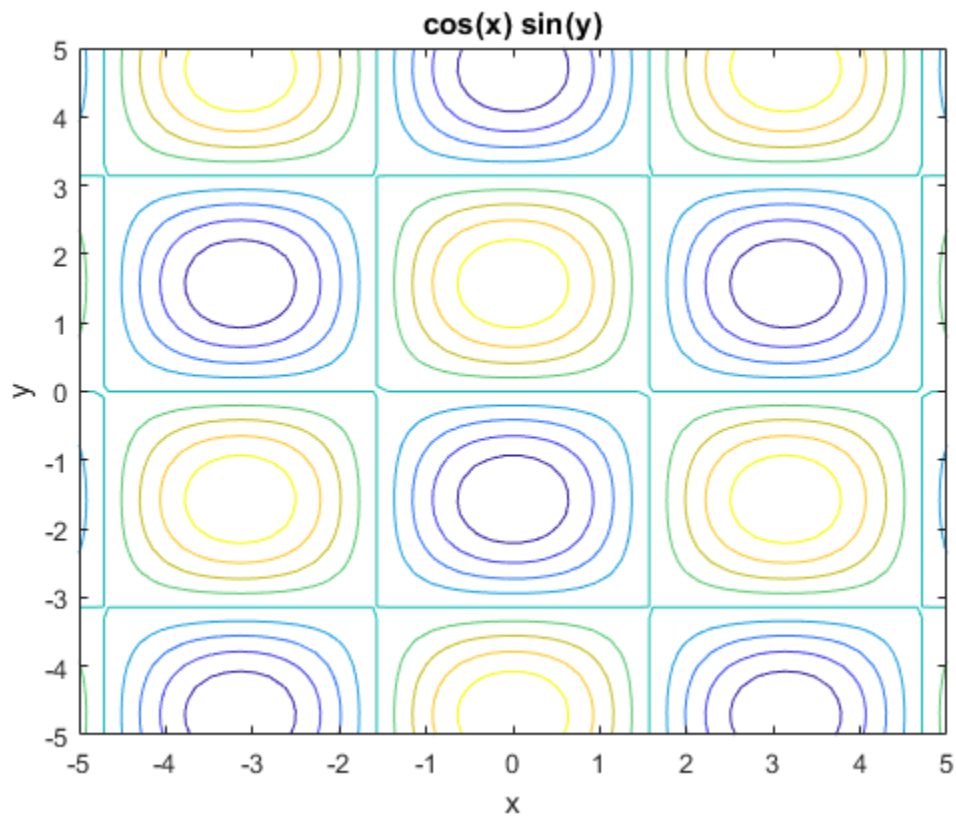
```
ans =

    82.3360
```

```matlab
syms x
syms y
%Problem 5a
z = cos(x)*sin(y);
ezsurf(z,[-5 5 -5 5])
```
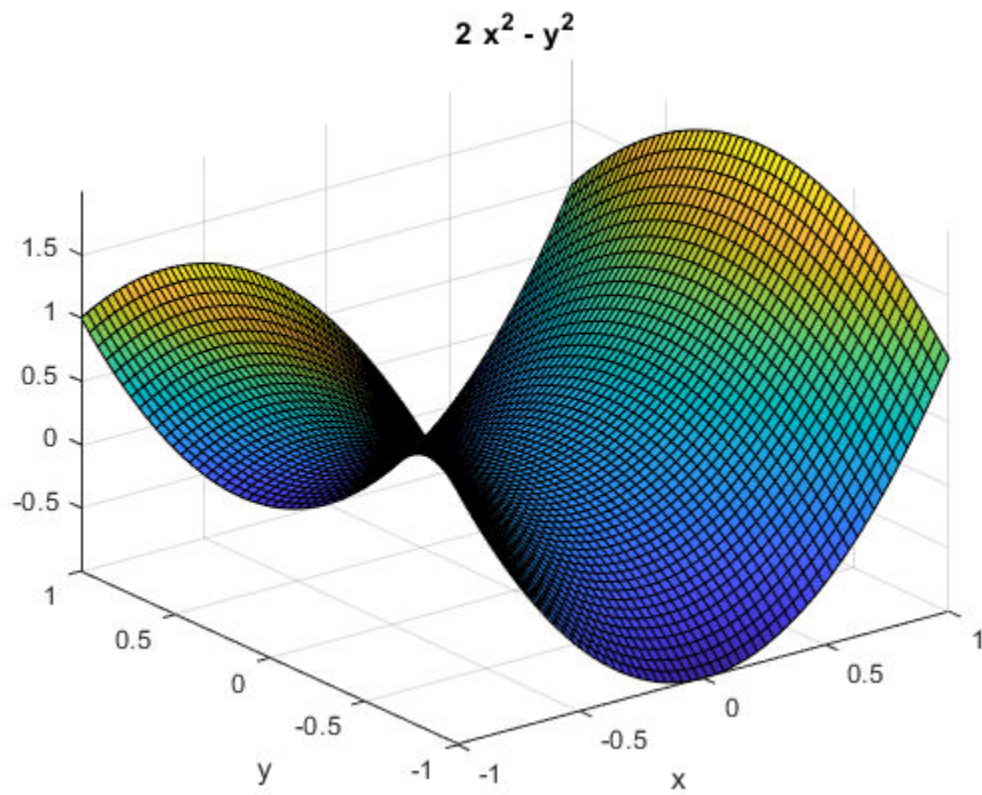
cos(x) sin(y)

%Problem 5b
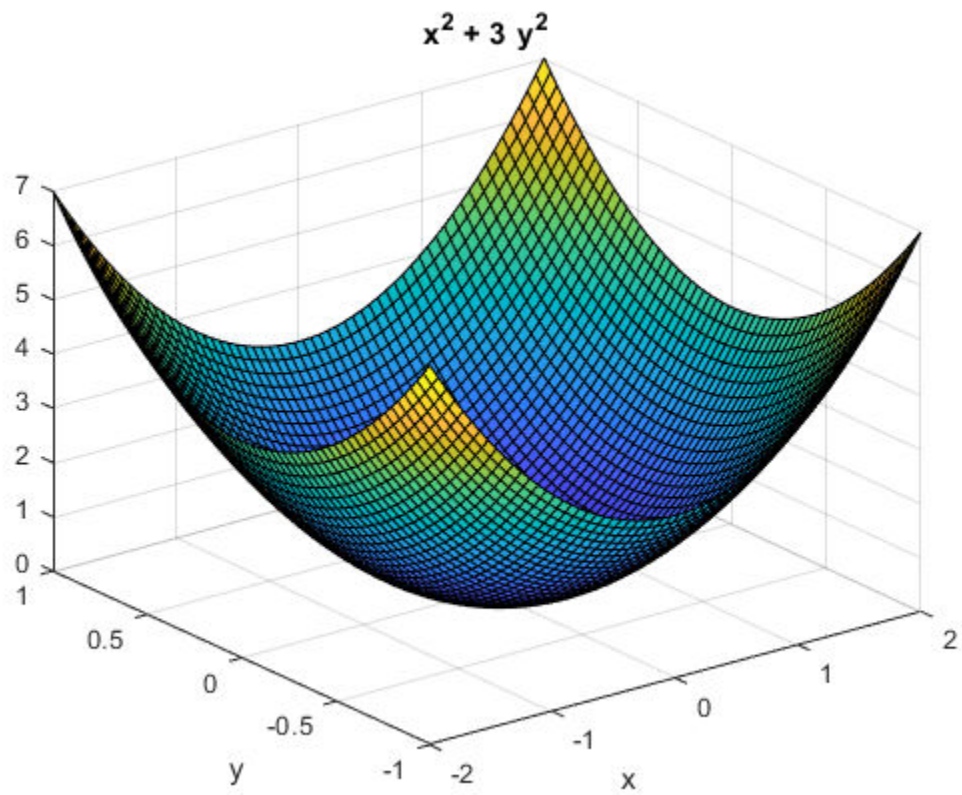ezcontour(z,[-5 5 -5 5])

cos(x) sin(y)

```matlab
syms x
syms y
%Problem 6a

hbp = (2*x^2 - y^2);
ezsurf(hbp,[-1 1 -1 1])
```
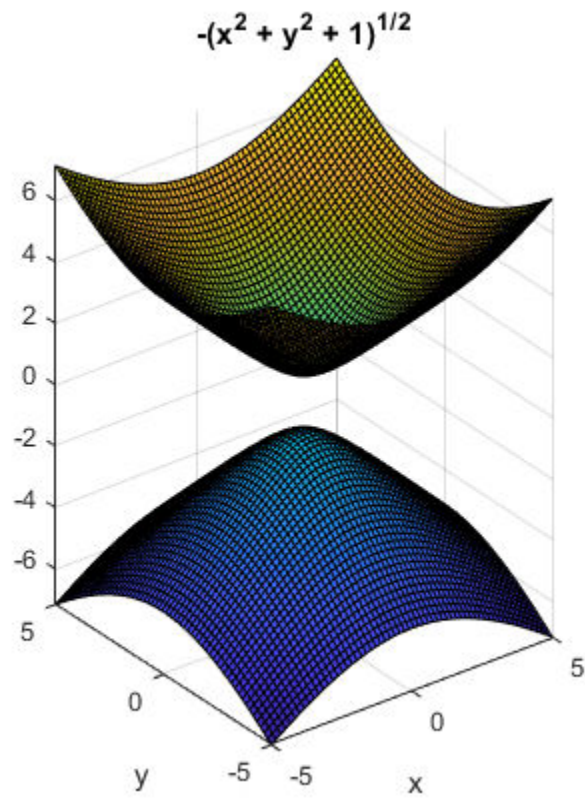
2 x² - y²

%Problem 6b

```
epp = (x^2 + (3*y^2));
ezsurf(epp,[-2 2 -1 1])
```

$x^2 + 3 y^2$

%Problem 6c

```
hbts = (sqrt(x^2 + y^2 + 1));
ezsurf(hbts,[-5 5 -5 5])
hold on
ezsurf(-hbts,[-5 5 -5 5])
axis equal
hold off
```

$-(x^2 + y^2 + 1)^{1/2}$

Published with MATLAB® R2024a