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%Math 241-Matlab Project 2
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```

```
%Task 1:
syms x y;
diff((cos(x^2*y))/(x^2),y)
```

```
ans =

-sin(x^2*y)
```

```
%Task 2:
syms x y;
diff(diff((x^3+2*y^2)/(x+y),y),x)
```

```
ans =

(2*(x^3 + 2*y^2))/(x + y)^3 - (4*y)/(x + y)^2 - (3*x^2)/(x + y)^2
```

```
%Task 3:
syms x y;
jacobian(x/y+x^2*y,[x y])
```

```
ans =

[ 2*x*y + 1/y, x^2 - x/y^2]
```

```
%Task 4:
syms x y;
subs(jacobian((x+y)/(x+2*y),[x y]),{x y},{-1,3})
```

```
ans =

[ 3/25, 1/25]
```

```
%Task 5:
syms x y;
a=[3 1];
dot((a/norm(a)),subs(jacobian(x^2+x*y^3,[x y]),{x,y},{5,-2}))
```

```
ans =

(33*10^(1/2))/5
```

```
%Task 6:
syms f(x,y)
f(x,y)=(y-3)*(log(x*y+x));
[xsoln,ysoln]=solve(jacobian(f,[x y]))
```

```
xsoln =

1/4


ysoln =

3
```

```
%Point=(1/4,3)
```

```
%Task 7
syms f(x,y)
f(x,y)=x^3+y^3+6*x*y;
[xsoln,ysoln]=solve(jacobian(f,[x y]))
```

```
xsoln =

             0
            -2
 1 + 3^(1/2)*1i
 1 - 3^(1/2)*1i


ysoln =
```

```
             0
            -2
 1 - 3^(1/2)*1i
 1 + 3^(1/2)*1i
```

```
%Points=(0,0),(-2,-2)
```

```
%Task 8
syms x y L;
f(x,y)=x*y;
g(x,y)=x^2+y^2+4*y-20;
firstpart=jacobian(f,[x y])-L*jacobian(g,[x y]);
[Lsoln,xsoln,ysoln]=solve([firstpart,g])
subs(f(x,y),{x,y},{xsoln,ysoln})
```

```
Lsoln =

 -15^(1/2)/6
  -2^(1/2)/4
   2^(1/2)/4
  15^(1/2)/6


xsoln =

   15^(1/2)
 -2*2^(1/2)
  2*2^(1/2)
  -15^(1/2)


ysoln =

 -5
  2
  2
 -5


ans =

 -5*15^(1/2)
  -4*2^(1/2)
   4*2^(1/2)
  5*15^(1/2)
```

```
%Summary-Maximum is 5*15^(1/2) and it occurs at the point (-15^(1/2),-5).
%Minimum is -5*15^(1/2) and it occurs at the point (15^(1/2),-5)
```

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