```
syms x y
g = (y^2 - 5*y)*sin(2*x)
```

$$g = -\sin(2\,x)\,(5\,y - y^2)$$

```
gx = diff(g,x)
```

$$gx = -2\cos(2\,x)\,(5\,y - y^2)$$

```
gy = diff(g,y)
```

$$gy = \sin(2\,x)\,(2\,y - 5)$$

```
sol = solve([gx==0,gy==0],[x,y],"ReturnConditions",true)
```

```
sol = struct with fields:
            x: [3x1 sym]
            y: [3x1 sym]
   parameters: k
   conditions: [3x1 sym]
```

```
sol.x
```

ans =

$$\begin{pmatrix} \dfrac{\pi\,k}{2} \\[2mm] \dfrac{\pi\,k}{2} \\[2mm] \dfrac{\pi}{4} + \dfrac{\pi\,k}{2} \end{pmatrix}$$

```
sol.y
```

ans =

$$\begin{pmatrix} 0 \\ 5 \\ \dfrac{5}{2} \end{pmatrix}$$

```
sol.parameters
```

ans = $k$

```
sol.conditions
```

ans =

$$\left. \begin{cases} k \in \mathbb{Z} \\ k \in \mathbb{Z} \\ k \in \mathbb{Z} \end{cases} \right)$$

```
gxx = diff(gx,x)
```

gxx = $4 \sin(2\,x)\,(5\,y - y^2)$

```
gyy =diff(gy,y)
```

gyy = $2 \sin(2\,x)$

```
gxy = diff(gy,x)
```

gxy = $2 \cos(2\,x)\,(2\,y - 5)$

```
D = gxx*gyy - gxy^2
```

D = $8 \sin(2\,x)^2\,(5\,y - y^2) - 4 \cos(2\,x)^2\,(2\,y - 5)^2$

```
syms m
assume(m,"Integer")
```

```
subs(D,[x,y],[m*pi/2 + pi/4, 5/2])
```

ans =

$$50 \sin\left(\frac{\pi}{2} + \pi\,m\right)^2$$

```
subs(gxx,[x,y],[m*pi/2 + pi/4, 5/2])
```

ans =

$$25 \sin\left(\frac{\pi}{2} + \pi\,m\right)$$

```
subs(D,[x,y],[m*pi/2, 0])
```

ans = $-100 \cos(\pi\,m)^2$

```
subs(D,[x,y],[m*pi/2 , 5])
```

ans = $-100 \cos(\pi\,m)^2$

```
a= pi/2
```

a =
1.5708
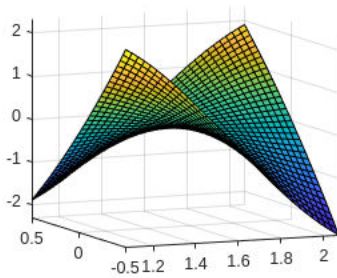
```
b = 0
```

b =
0

```
r = 0.5
```

r =
0.5000

```
fsurf(g,[a - r, a+ r, b - r, b+r])
```



```
g
```

$g = -\sin(2\,x)\,(5\,y - y^2)$

```
taylor(g,[x,y])
```

ans =

$$-\frac{4\,x^3\,y^2}{3} + \frac{20\,x^3\,y}{3} + 2\,x\,y^2 - 10\,x\,y$$

```
syms h k
```

```
subs(g,[x,y],[0,0])
```

ans = $0$

```
Dg = h*diff(g,x) + k*diff(g,y)
```

Dg = $k\sin(2\,x)\,(2\,y - 5) - 2\,h\cos(2\,x)\,(5\,y - y^2)$

```
subs(Dg,[x,y],[0,0])
```

```
ans = 0
```

```
D2g = h*diff(Dg,x)+ k*diff(Dg,y)
```

D2g = $k \, (2 \, k \, \sin{(2 \, x)} + 2 \, h \cos{(2 \, x)} \, (2 \, y - 5)) + h \, (2 \, k \cos{(2 \, x)} \, (2 \, y - 5) + 4 \, h \sin{(2 \, x)} \, (5 \, y - y^2))$

```
subs(D2g,[x,y],[0,0])
```

ans = $-20 \, h \, k$