```
> restart;
> m:=-15*sqrt(3)*T/2/a^5;
```

$$m := -\frac{15}{2}\frac{\sqrt{3}\ T}{a^5}$$

```
> fai:=m*(x-a)*(x-sqrt(3)*y)*(x+sqrt(3)*y);
```

$$fai := -\frac{15}{2}\frac{\sqrt{3}\ T(x-a)(x-\sqrt{3}\ y)(x+\sqrt{3}\ y)}{a^5}$$

```
> simplify(fai);
```

$$-\frac{15}{2}\frac{\sqrt{3}\ T(x-a)(x^2-3y^2)}{a^5}$$

```
> zy:=-(diff(fai,x));
```

$$zy := \frac{15}{2}\frac{\sqrt{3}\ T(x-\sqrt{3}\ y)(x+\sqrt{3}\ y)}{a^5} + \frac{\frac{15}{2}\sqrt{3}\ T(x-a)(x+\sqrt{3}\ y)}{a^5} + \frac{\frac{15}{2}\sqrt{3}\ T(x-a)(x-\sqrt{3}\ y)}{a^5}$$

```
> # 切应力y
> simplify(zy);
```

$$\frac{15}{2}\frac{\sqrt{3}\ T(3x^2-3y^2-2ax)}{a^5}$$

```
> zx:=diff(fai,y);
```

$$zx := \frac{45}{2}\frac{T(x-a)(x+\sqrt{3}\ y)}{a^5} - \frac{45}{2}\frac{T(x-a)(x-\sqrt{3}\ y)}{a^5}$$

```
> # 切应力x
> simplify(zx);
```

$$45\frac{T(x-a)\sqrt{3}\ y}{a^5}$$

```
>
> f:=(x,y)->-15/2*3^(1/2)*T*(-3*x^2+3*y^2+2*a*x)/a^5;
```

$$f := (x,y) \to -\frac{15}{2}\frac{\sqrt{3}\ T(-3x^2+3y^2+2ax)}{a^5}$$

```
> # 求 切应力y 的 两个偏导
> fx:=D[1](f)(x,y);
```

$$fx := -\frac{15}{2}\frac{\sqrt{3}\ T(-6x+2a)}{a^5}$$

```
> fy:=D[2](f)(x,y);
```

$$fy := -45\frac{\sqrt{3}\ Ty}{a^5}$$

```
> #求 驻点
> solve({D[1](f)(x,y)=0,D[2](f)(x,y)=0},{x,y});
```

$$\{y = 0, x = \frac{1}{3}a\}$$

```
> # 求ABC ， 判断 是否为极值
> A:=D[1,1](f)(x,y);
```

$$A := 45\frac{\sqrt{3}\ T}{a^5}$$

```
> B:=D[1,2](f)(x,y);
```

$$B := 0$$

```
> C:=D[2,2](f)(x,y);
```

$$C := -45\frac{\sqrt{3}\ T}{a^5}$$

```
>
> Delta:=A*C-B^2;
```

$$\Delta := -6075\frac{T^2}{a^{10}}$$

```
> # 驻点切应力
> x0:=a/3;y0:=0;
```

$$x0 := \frac{1}{3}a$$

$$y0 := 0$$

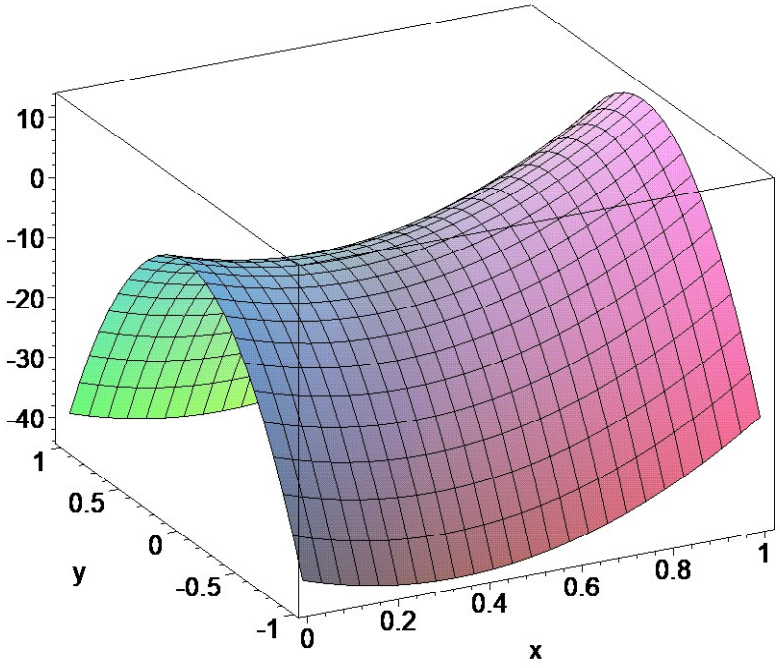
```
> f(x0,y0);
```

$$-\frac{5}{2}\frac{\sqrt{3}\ T}{a^3}$$

```
> # Delta<0,  非 极值
>
> # 作图取M=1,a=1
> ff:=-15/2*3^(1/2)*1*(-3*x^2+3*y^2+2*1*x)/1^5;
```

$$ff := -\frac{15}{2}\sqrt{3}\ (-3x^2 + 3y^2 + 2x)$$

```
> plot3d(ff,x=0..1,y=-1..1);
```




```
> #真实最大切应力
> Ty:=f(a,0);
```

$$Ty := \frac{15}{2}\frac{\sqrt{3}\ T}{a^3}$$

```
>
> #  同理计算切应力x
> f2:=(x,y)->-45*T*(-x+a)*3^(1/2)*y/a^5;
```

$$f2 := (x, y) \to -45\frac{T\,(-x+a)\sqrt{3}\ y}{a^5}$$

```
> fx2:=D[1](f2)(x,y);
```

$$fx2 := 45\frac{\sqrt{3}\ T y}{a^5}$$

```
> fy2:=D[2](f2)(x,y);
```

$$fy2 := -45\frac{T\,(-x+a)\sqrt{3}}{a^5}$$

```
> solve({D[1](f2)(x,y)=0,D[2](f2)(x,y)=0},{x,y});
```

$$\{x = a, y = 0\}$$

```
>
> AA:=D[1,1](f2)(x,y);
```

$$AA := 0$$

```
> BB:=D[1,2](f2)(x,y);
```

$$BB := 45\frac{\sqrt{3}\ T}{a^5}$$

```
> CC:=D[2,2](f2)(x,y);
```

$$CC := 0$$

```
> Delta2:=AA*CC-BB^2;
```

$$\Delta 2 := -6075\,\frac{T^2}{a^{10}}$$

```
> x2:=a;y2:=0;
```

$$x2 := a$$

$$y2 := 0$$

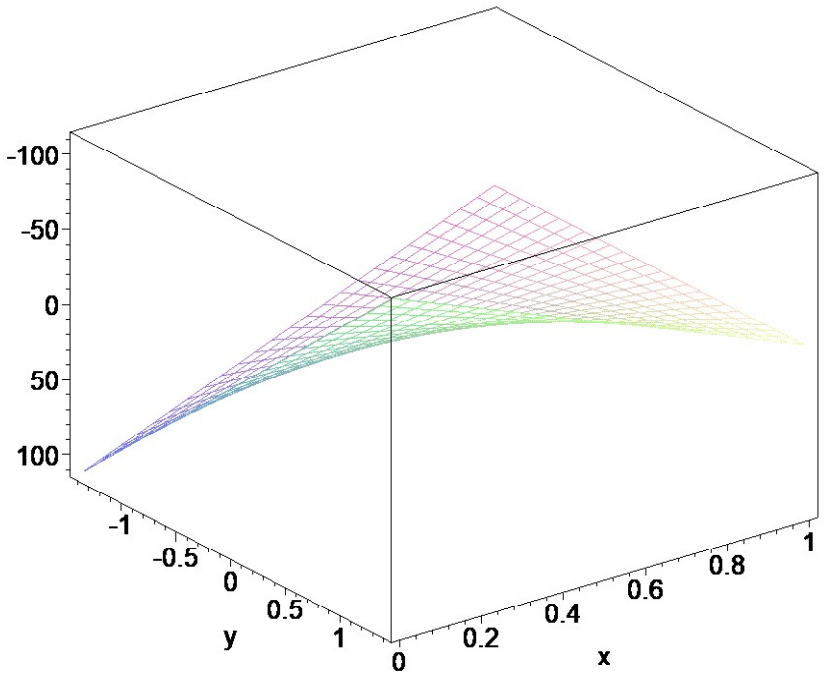
```
> f2(x2,y2);
```

$$0$$

```
> ff2:=-45*1*(-x+1)*3^(1/2)*y/1^5;
```

$$ff2 := -45\,(-x+1)\sqrt{3}\,y$$

```
> plot3d(ff2,x=0..1,y=-1.414..1.414);
```




```
> # 求条件极值
> ff3:=simplify(-45*1*(-x+1)*x);
```

$$ff3 := 45\,(x-1)\,x$$

```
> f3:=(x)->-45*T*(-x+a)*x/a^4;
```

$$f3 := x \to -45\,\frac{T\,(-x+a)\,x}{a^4}$$

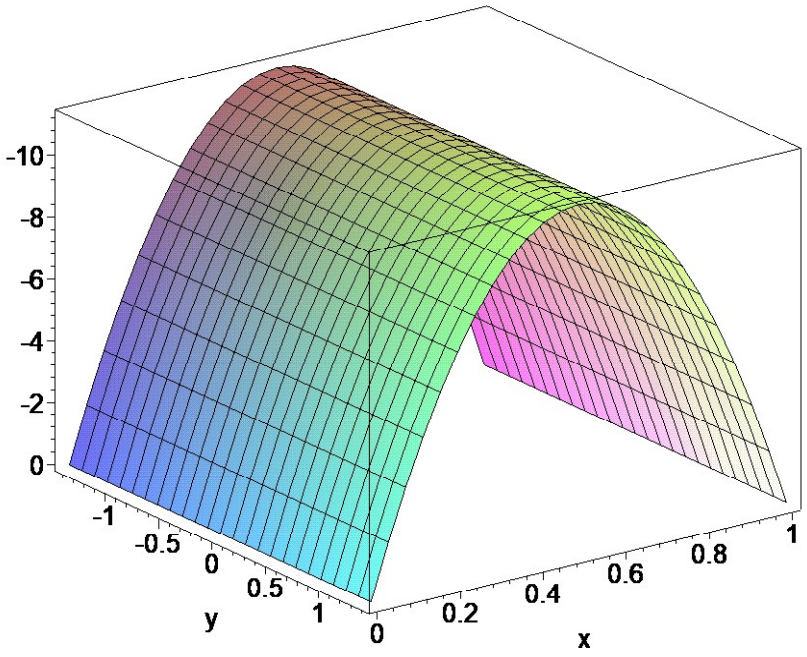
```
> solve({D[1](f3)(x)=0},{x});
```

$$\{x = \frac{1}{2}\,a\}$$

```
> #真实最大切应力
> Tx:=f3(a/2,0);
```

$$Tx := -\frac{45}{4}\frac{T}{a^2}$$

```
>
>
> plot3d(ff3,x=0..1,y=-1.414..1.414);
```




```
> # 比较两方向最大切应力， 取T=1， a=1
> 15*sqrt(3.)/2;
```

12.99038106

```
> 45/4.;
```

11.25000000

```
> Tmax:=Ty;
```

$$Tmax := \frac{15}{2}\frac{\sqrt{3}\,T}{a^3}$$

```
>
```