

# Cálculo 3 - 2024.1

Aula 20: exercícios sobre pontos críticos

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<http://anggtwu.net/2024.1-C3.html>

## Links

StewPtCap14p55 (p.841) O vetor gradiente

StewPtCap14p65 (p.851) Teste da segunda derivada

StewPtCap14p70 (p.856) 14.7 Exercícios (vamos fazer o 10)

3fT85 2022.2: P1, gabarito da questão 2

<http://anggtwu.net/e/maxima.e.html#2024.1-stewart-p856-ex10>

<http://anggtwu.net/MAXIMA/myqdraw1.mac.html>

(find-es "maxima" "2024.1-stewart-p856-ex10")

(find-angg "MAXIMA/myqdraw1.mac")

## Stewart, p.856, exercício 10

```
(%i1) F : x*y * (1-x*y);
```

```
(%o1)
```

$$xy(1 - xy)$$

```
(%i2) F : x*y * (1-x-y);
```

```
(%o2)
```

$$x(-y - x + 1)y$$

```
(%i3) Fx : diff(F, x);
```

```
(%o3)
```

$$(-y - x + 1)y - xy$$

```
(%i4) Fy : diff(F, y);
```

```
(%o4)
```

$$x(-y - x + 1) - xy$$

```
(%i5) Fxx : diff(Fx, x);
```

```
(%o5)
```

$$-(2y)$$

```
(%i6) Fxy : diff(Fx, y);
```

```
(%o6)
```

$$-(2y) - 2x + 1$$

```
(%i7) Fyy : diff(Fy, y);
```

```
(%o7)
```

$$-(2x)$$

```
(%i8) [xmin,ymin,xmax,ymax] : [-2,-2,2,2];
```

```
(%o8)
```

$$[-2, -2, 2, 2]$$

```
(%i9) mylevel(eq,[opts]) :=
```

```
  apply('impl, append([eq, x,xmin,xmax, y,ymin,ymax], opts))$
```

```
(%i10) myQdraw("Stewart-p856-exerc10-F", "height=2.5cm",
  mylevel(F=0, lk("F=0"), lc(orange)),
  mylevel(F=0.2, lk("F=0.2"), lc(red)),
  mylevel(F=-0.2, lk("F=-0.2"), lc(forest_green))
);
```

```
(%o10)
```



```
(%i11) myQdraw("Stewart-p856-exerc10-Fx-Fy", "height=2.5cm",
```

```
  mylevel(Fx=0, lk("Fx=0"), lc(red)),
  mylevel(Fy=0, lk("Fy=0"), lc(orange))
```

```
);
```

```
(%o11)
```



```
(%i12) pontoscriticos : solve([Fx=0, Fy=0], [x,y]);
```

```
(%o12)
```

$$\left[ \left[ x = 0, y = 0 \right], \left[ x = 0, y = 1 \right], \left[ x = 1, y = 0 \right], \left[ x = \frac{1}{3}, y = \frac{1}{3} \right] \right]$$

```
(%i13) [P1,P2,P3,P4] : pontoscriticos;
```

```
(%o13)
```

$$\left[ \left[ x = 0, y = 0 \right], \left[ x = 0, y = 1 \right], \left[ x = 1, y = 0 \right], \left[ x = \frac{1}{3}, y = \frac{1}{3} \right] \right]$$

```
(%i14) at([Fxx,Fxy,Fyy], P1);
```

```
(%o14)
```

$$[0, 1, 0]$$

```
(%i15) at([Fxx,Fxy,Fyy], P2);
```

```
(%o15)
```

$$[-2, -1, 0]$$

```
(%i16) at([Fxx,Fxy,Fyy], P3);
```

```
(%o16)
```

$$[0, -1, -2]$$

```
(%i17) at([Fxx,Fxy,Fyy], P4);
```

```
(%o17)
```

$$\left[ -\left(\frac{2}{3}\right), -\left(\frac{1}{3}\right), -\left(\frac{2}{3}\right) \right]$$

```
(%i18)
```