5.

Exercício 5.1

a)

```
f[x_, y_, z_] = x^2 + 2 y^2 + 3 z^2; ponto = {1, 1, 1};
```

```
f @@ ponto
```

```
6
```

```
Gradf[x_, y_, z_] = Grad[f[x, y, z], {x, y, z}]
```

```
{2 x, 4 y, 6 z}
```

Reta normal

y = -1+2 x
z = -2+3 x

Plano tangente

$$z = \frac{1}{3}(6 - x - 2y)$$

b)

```
f[x_, y_, z_] = x y z^2; ponto = {1, 1, 1};
```

```
f @@ ponto
```

```
1
```

```
Gradf[x_, y_, z_] = Grad[f[x, y, z], {x, y, z}]
```

$$\{y\,z^2,\ x\,z^2,\ 2\,x\,y\,z\}$$

Reta normal

$$y = x$$
$$z = -1+2\,x$$

Plano tangente

$$z = \frac{1}{2}\,(4 - x - y)$$

c)

```
f[x_, y_, z_] = x^2 + 3 y^3 + Sin[x y] - z; ponto = {1, 0, 1};
```

```
f @@ ponto
```

0

```
Gradf[x_, y_, z_] = Grad[f[x, y, z], {x, y, z}]
```

$$\{2\,x + y\,\mathrm{Cos}[x\,y],\ 9\,y^2 + x\,\mathrm{Cos}[x\,y],\ -1\}$$

Reta normal

$$y = \frac{1}{2}\,(-1 + x)$$
$$z = \frac{3}{2} - \frac{x}{2}$$

Plano tangente

$$z = -1 + 2\,x + y$$

d)

```
f[x_, y_, z_] = Exp[x y z]; ponto = {1, 1, 0};
```

```
f @@ ponto
```

```
1
```

```
Gradf[x_, y_, z_] = Grad[f[x, y, z], {x, y, z}]
```

$$\{e^{x\,y\,z}\,y\,z,\ e^{x\,y\,z}\,x\,z,\ e^{x\,y\,z}\,x\,y\}$$

Reta normal

$$x = 1$$
$$y = 1$$

Plano tangente

$$z = 0$$

Exercício 5.2

a)

```
f[x_, y_, z_] = x^3 + x y z; ponto = {2, 2, 1};
```

```
f @@ ponto
```

```
12
```

```
Gradf[x_, y_, z_] = Grad[f[x, y, z], {x, y, z}]
```

$$\{3\,x^2 + y\,z,\ x\,z,\ x\,y\}$$

Reta normal

$$y = \frac{12 + x}{7}$$
$$z = \frac{3}{7} + \frac{2\,x}{7}$$

Plano tangente

$$z = \frac{1}{2}(18 - 7x - y)$$

b)

Não

Exercício 5.3

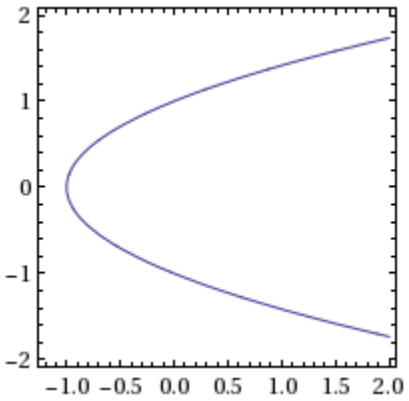
a)

```
f[x_, y_] = x - y^2; A = {-1, 0};
```

```
f @@ A
```

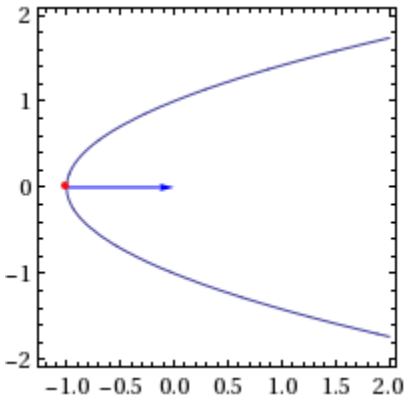
```
-1
```

$$x = -1 + y^2$$



b)

```
{1, -2 y}
```



c)

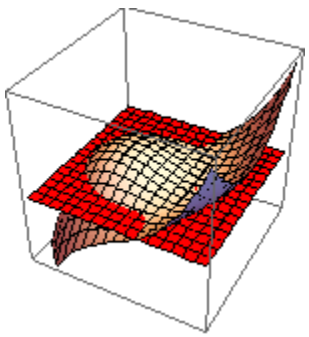
```
z = x
```

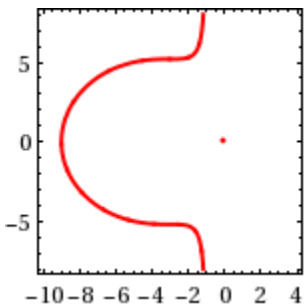
Exercício 5.4

```
f[x_, y_] = x (x^2 + y^2) + 9 x^2 + y^2;
```

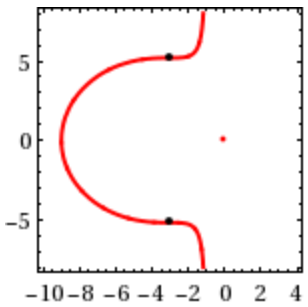
```
Grad[f[x, y], {x, y}]
```

$$\{18\,x + 3\,x^2 + y^2,\ 2\,y + 2\,x\,y\}$$

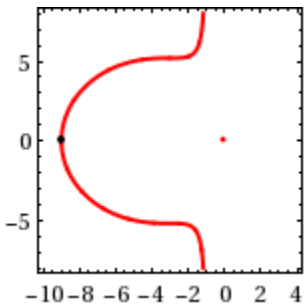




$$\left\{\left\{-3,\ -3\sqrt{3}\right\},\ \left\{-3,\ 3\sqrt{3}\right\}\right\}$$



$$\{\{-9,\ 0\}\}$$



Exercício 5.5

$$\left\{\{0,\ 1\},\ \left\{\frac{2}{3},\ -\frac{1}{3}\right\}\right\}$$

Exercício 5.6

$$\left\{\left\{\frac{2}{3},\ -\frac{4}{3}\right\},\ \{2,\ 0\}\right\}$$

Exercício 5.7

```
f[x_, y_, z_] = x^2 + y^2 + z^2;
```

$$z = \frac{5+y}{2}$$

e

$$x = \frac{5 - y}{2}$$

Exercício 5.8

$\nabla f(P)\cdot e_1<0$; $\nabla f(Q)\cdot e_2>0$

Created with the Wolfram Language