5.

Exercício 5.1

a)

```
f[x_, y_, z_] = x^2 + 2 y^2 + 3 z^2; ponto = {1, 1, 1}
{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}
{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 Cos[x y], 9 y^2 + x Cos[x y], -1}
```

Reta normal

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

$$z = \frac{3}{2} - \frac{x}{2}$$

Plano tangente

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

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}
{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

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

b)

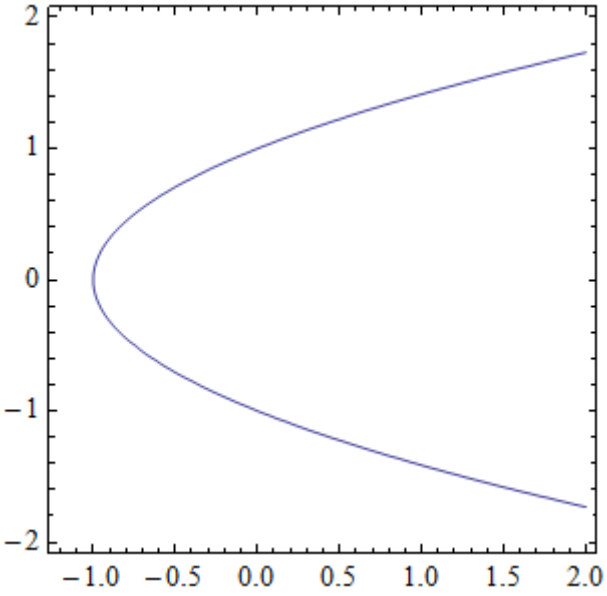
Não

Exercício 5.3

a)

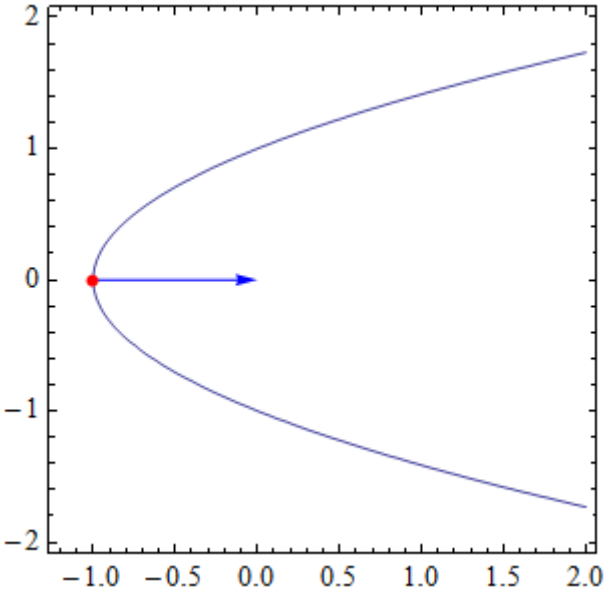
```
f[x_, y_] = x - y^2; A = {-1, 0};
f @@ A
-1
```

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



b)

```
Gradf[x_, y_] = Grad[f[x, y], {x, y}]
{1, -2 y}
```



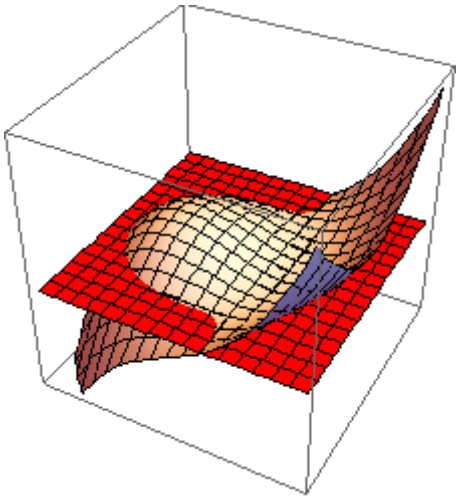
c)

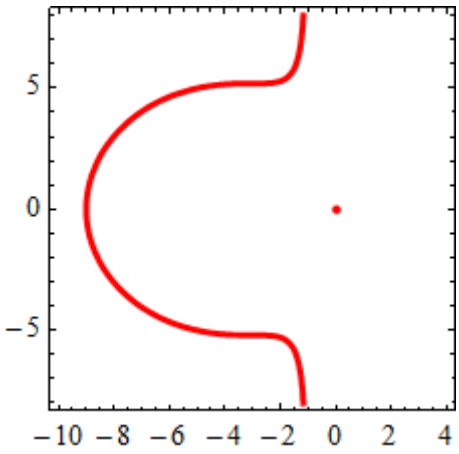
```
Print["z = ", f @@ A + Gradf @@ A . ({x, y} - A)]

z = x
```

Exercício 5.4

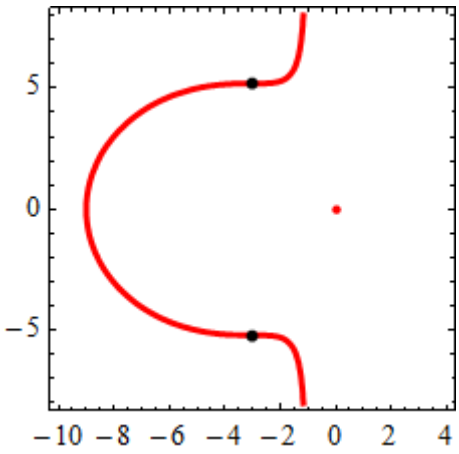
```
f[x_, y_] = x (x^2 + y^2) + 9 x^2 + y^2;
Grad[f[x, y], {x, y}]
```

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

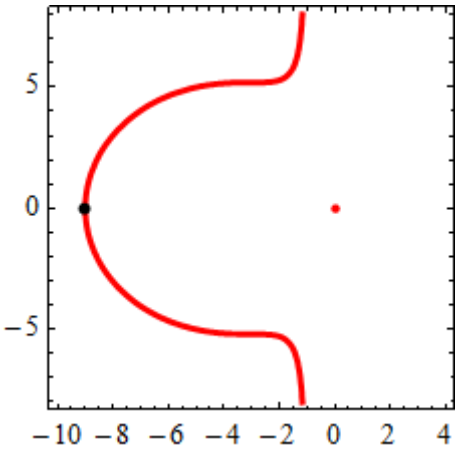




$$\{\{-3,\ -3\sqrt{3}\},\ \{-3,\ 3\sqrt{3}\}\}$$



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



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

$$\text{ArcCos}\left[\sqrt{\frac{2}{3}}\right]$$