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

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

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

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

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}
```

```
{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

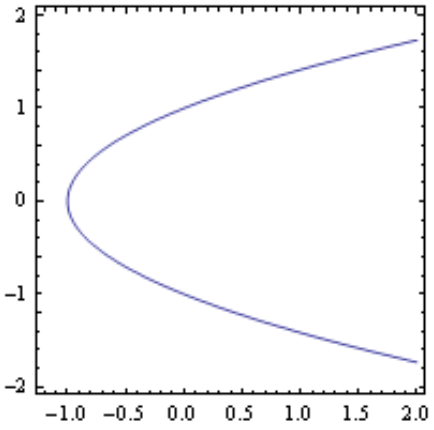
a)

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

```
f @@ A
```

```
-1
```

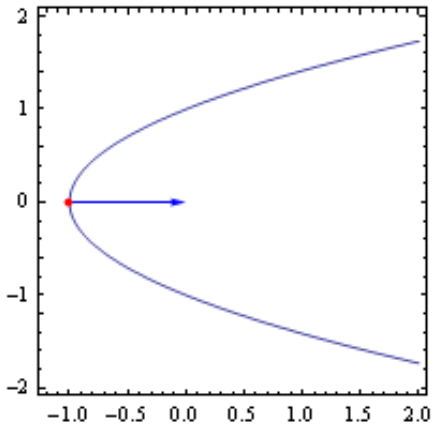
$$x = -1 + y^2$$



b)

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

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



c)

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

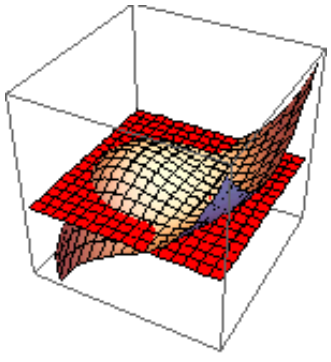
```
z = x
```

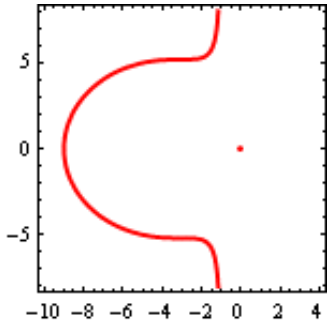
Exercício 5.4

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

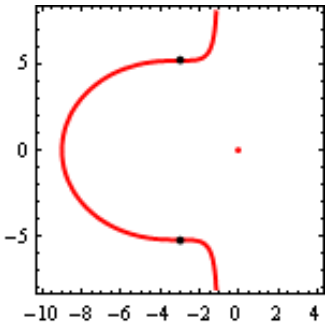
```
Grad[f[x, y], {x, y}]
```

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

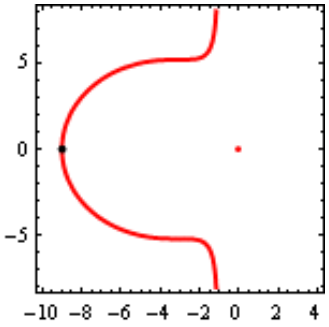




$$\{\{-3, -3\sqrt{3}\}, \{-3, 3\sqrt{3}\}\}$$



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



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

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

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