Exercício 2

Considere $f : [0, 1] \rightarrow \mathbb{R}$ definida por $f(x) = \sqrt{x} - cosx$ e $\varepsilon = 10^{-4}$.

(a) Estime, utilizando a fórmula deduzida no exercício 1, o número de iterações executadas

In [1]:
```
import math
```

In [2]:
```
a=0
b=1
precisao = 10**-4
k = (math.log(b-a,10) - math.log(precisao,10)) / math.log(2,10)
k
```

Out[2]: 13.287712379549449

Resposta a:

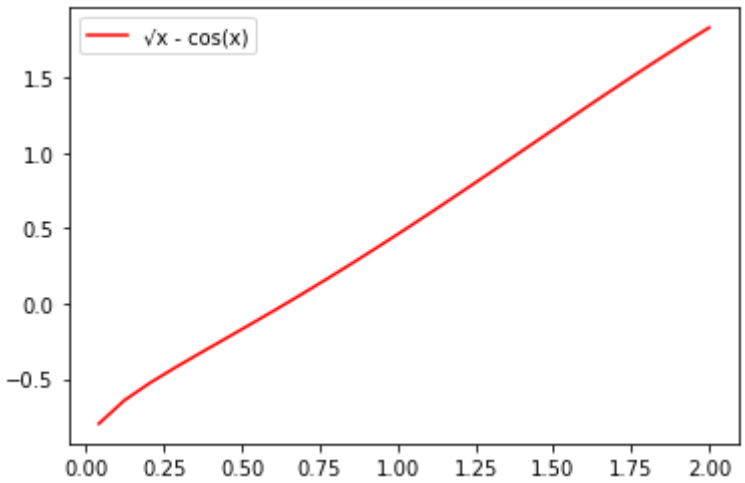
$k \approx 14$

(b) Determine um zero de f, no intervalo dado, pelo algoritimo que você implementou para

In [3]:
```
%matplotlib inline
import matplotlib.pyplot as plt
import numpy as np

xx = np.linspace(-2,2,50)
plt.figure(1)
y= np.sqrt(xx)-np.cos(xx)
plt.plot(xx,y,'-r',label = '√x - cos(x)')
plt.legend()
```

```
<ipython-input-3-bbbc15d7e0dd>:7: RuntimeWarning: invalid value encountered in sqrt
  y= np.sqrt(xx)-np.cos(xx)
```

Out[3]: <matplotlib.legend.Legend at 0x17c3a75aee0>



In [4]:
```
def fx(x):
    return math.sqrt(x)-math.cos(x)
```

In [5]:
```
print(fx(a)*fx(b))
```

```
-0.45969769413186023
```

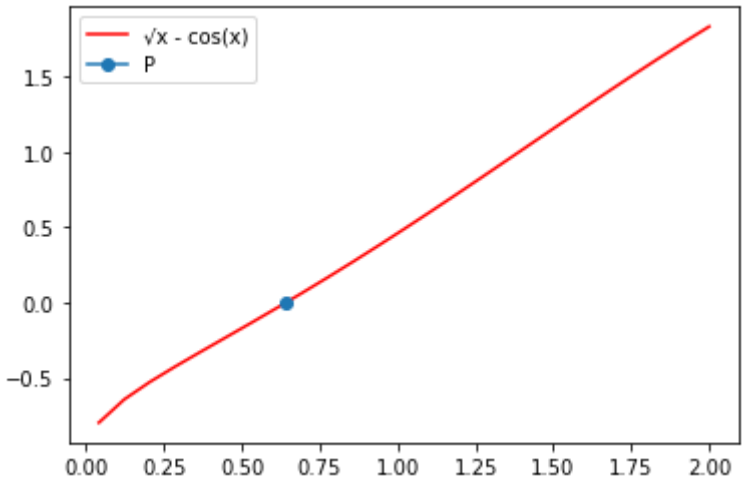
In [6]:
```
x = a
k=14
for kBarra in range(1,k):
    xOld = x
    x=(a+b)/2

    if fx(a)*fx(x) < 0:
        b=x
    else:
        a=x

print("x= ", x,"f(x) = ",fx(x))
```

```
x=  0.6417236328125 f(x) =  1.1324904157783422e-05
```

In [7]:
```
xx = np.linspace(-2,2,50)
plt.figure(1)
y= np.sqrt(xx)-np.cos(xx)
plt.plot(xx,y,'-r',label = '√x - cos(x)')
plt.plot(0.6417236328125,0,'-',label = 'P',marker = 'o')
plt.legend()
```

```
<ipython-input-7-170753f7b8ae>:3: RuntimeWarning: invalid value encountered in sqrt
  y= np.sqrt(xx)-np.cos(xx)
```

Out[7]:
```
<matplotlib.legend.Legend at 0x17c3c9a07c0>
```



Resposta b:

Com 14 iterações encontramos x= 0.6417236328125 e f(x) = 1.1324904157783422e-05

In [ ]: