In [11]:
```
import numpy as np
from matplotlib import pyplot as plt
```

In [12]:
```
def fun(x):
    return x*np.sin(x) + np.cos(x)
```

In [13]:
```
def bisection(a,b,tol,max_iter):
    if fun(a)*fun(b)>0:
        print("Roots not founded.")
        return None
    for i in range (1,max_iter):
        c=(a+b)/2
        print(f"{i:4d} | {a:10.6f} | {b:10.6f} | {c:10.6f} | {fun(c):12.6e
        
        if abs(b-a)<tol:
            return c
        if fun(a)*c<0:
            b=c
        else:
            a=c
```

In [18]:
```
root=bisection(28,28.5,1e-4,100)
print(np.round(root,4))
```

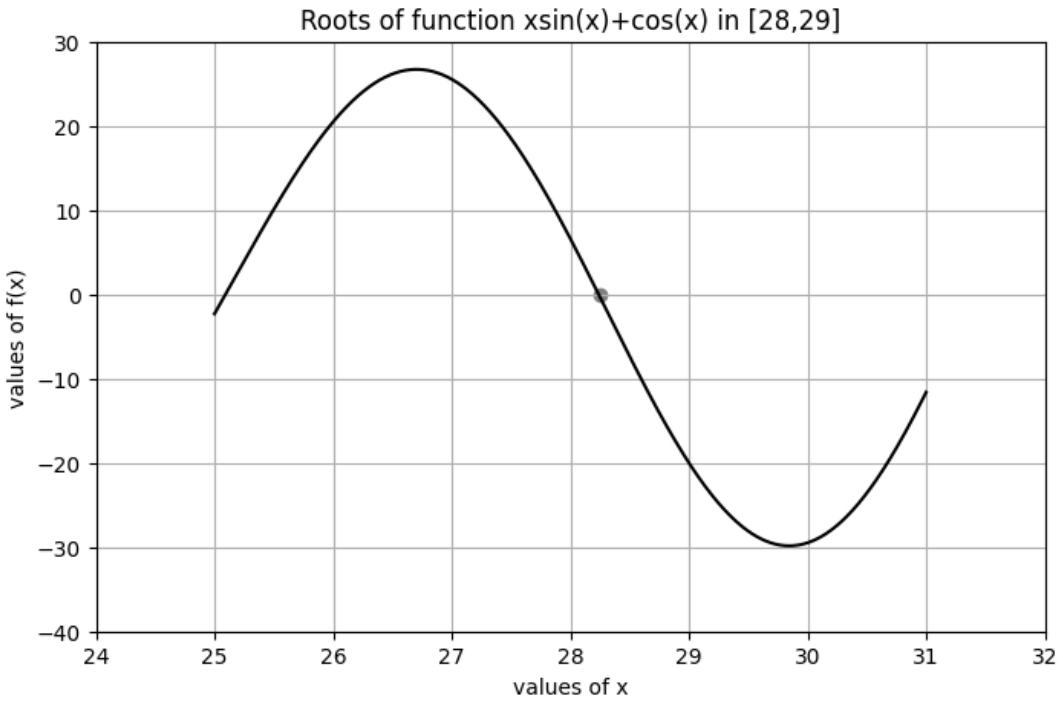
```
   1 |  28.000000 |  28.500000 |  28.250000 | -3.123396e-01
   2 |  28.250000 |  28.500000 |  28.375000 | -3.846517e+00
   3 |  28.250000 |  28.375000 |  28.312500 | -2.079588e+00
   4 |  28.250000 |  28.312500 |  28.281250 | -1.195571e+00
   5 |  28.250000 |  28.281250 |  28.265625 | -7.538032e-01
   6 |  28.250000 |  28.265625 |  28.257812 | -5.330266e-01
   7 |  28.250000 |  28.257812 |  28.253906 | -4.226711e-01
   8 |  28.250000 |  28.253906 |  28.251953 | -3.675022e-01
   9 |  28.250000 |  28.251953 |  28.250977 | -3.399201e-01
  10 |  28.250000 |  28.250977 |  28.250488 | -3.261297e-01
  11 |  28.250000 |  28.250488 |  28.250244 | -3.192346e-01
  12 |  28.250000 |  28.250244 |  28.250122 | -3.157871e-01
  13 |  28.250000 |  28.250122 |  28.250061 | -3.140633e-01
  14 |  28.250000 |  28.250061 |  28.250031 | -3.132015e-01
28.25
```

In [17]:
```
x=np.linspace(25,31,600)

fig,ax=plt.subplots(figsize=(8,5))
ax.plot(x,fun(x),color="black")
ax.scatter(root,0,color="grey")

ax.set_title("Roots of function xsin(x)+cos(x) in [28,29]")

ax.set_xlabel("values of x")
ax.set_ylabel("values of f(x)")
ax.set_ylim(-40,30)
ax.set_xlim(24,32)
ax.grid()
plt.show()
```


Roots of function xsin(x)+cos(x) in [28,29]
values of f(x)
values of x
30
20
10
0
−10
−20
−30
−40
24
25
26
27
28
29
30
31
32

In [ ]: