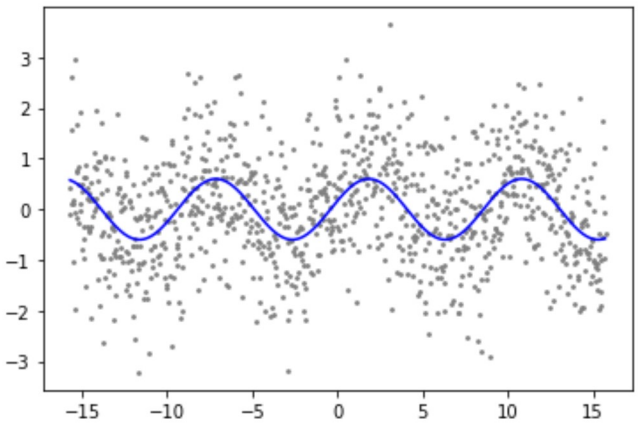
Task 1.

In [24]:
```
from matplotlib import pyplot as plt
import numpy as np
import random
```

In [41]:
```
x = np.linspace(-np.pi*5, np.pi*5, 1000)
y = 0.6*np.cos(0.7*x+5)
noisy_y = y + np.random.normal(0,1,x.shape) # generating normal distributed noise
plt.scatter(x,noisy_y,s=3,color='grey')
plt.plot(x,y,color='b')
print("Variance is:", np.var(noisy_y), "Mean is:", np.mean(noisy_y))
```

```
Variance is: 1.1260042684663587 Mean is: 0.0005626986050413407
```



So I am using 0.6 as amplitude value, 0.7 as frequency and 5 as shift rigth. Let's now try to estimate the amplitude.

In [52]:
```
roof = sum([i*np.cos(0.7*j + 5) for i,j in zip(noisy_y,x)])
floor = sum([np.cos(0.7*i+5)**2 for i in x])
plt.plot(x, (roof/floor)*np.cos(0.7*x+5), color='r')
plt.scatter(x,noisy_y,s=3,color='grey')
exp_amp = []
for i in range(0,10000):
    exp_amp.append(roof/floor)
print(np.mean(exp_amp))
```

```
0.5956009029928934
```