In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import time
```

```
C:\Users\Abhishek\anaconda3\lib\site-packages\scipy\__init__.py:146: UserWarning: A NumPy
version >=1.16.5 and <1.23.0 is required for this version of SciPy (detected version 1.26.0
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
```

In [2]:
```
# The function
def f(x):
    return (x + 3)**2
```

In [3]:
```
# The derivative
def df(x):
    return 2*(x+3)
```

In [4]:
```
 # starting point and learning rate
x = 2
learning_rate = 0.1
```

In [7]:
```
# set number of iterations and toleration convergence
num_iteration = 100
tolerance = 1e-6
```

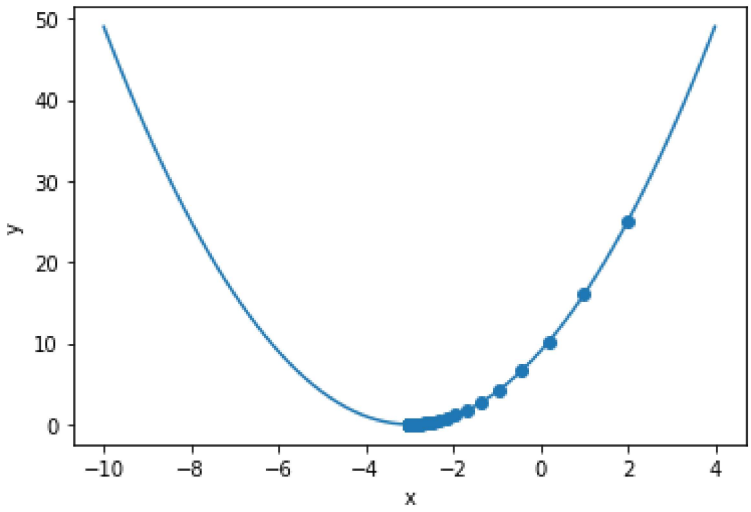
In [8]:
```
x_history = []
y_history = []
```

In [9]:
```
# gradient descent
for i in range(num_iteration):
    gradient  = df(x) # slope
    x_new = x - gradient*learning_rate
    x_history.append(x)
    y_history.append(f(x))
    if abs(x_new - x) < tolerance:
        break
    x = x_new
```

In [10]:
```
x_values = np.linspace(-10, 4,100)
y_values = f(x_values)
```

In [12]:
```
plt.plot(x_values,y_values, label = ' y = (x+3)^2')
plt.scatter(x_history,y_history)
plt.xlabel("x")
plt.ylabel("y")
```

Out[12]: Text(0, 0.5, 'y')



In [ ]: