In [ ]:
```
#HW1.2

import scipy
import numpy as np
import matplotlib.pyplot as plt

n = [20, 100]

p1 = np.poly1d([1,2])
p2 = np.poly1d([1, 7+5j])
p3 = np.poly1d([1, 7-5j])

d = p1*p2*p3
print(d)

residues = scipy.signal.residue(n, d)
residues
```

```
   3      2
1 x + 16 x + 102 x + 148
```

Out[ ]:
```
(array([ 1.2-4.69567813e-16j, -0.6-1.40000000e+00j, -0.6+1.40000000e+00j]),
 array([-2.-2.70263575e-16j, -7.+5.00000000e+00j, -7.-5.00000000e+00j]),
 array([], dtype=float64))
```

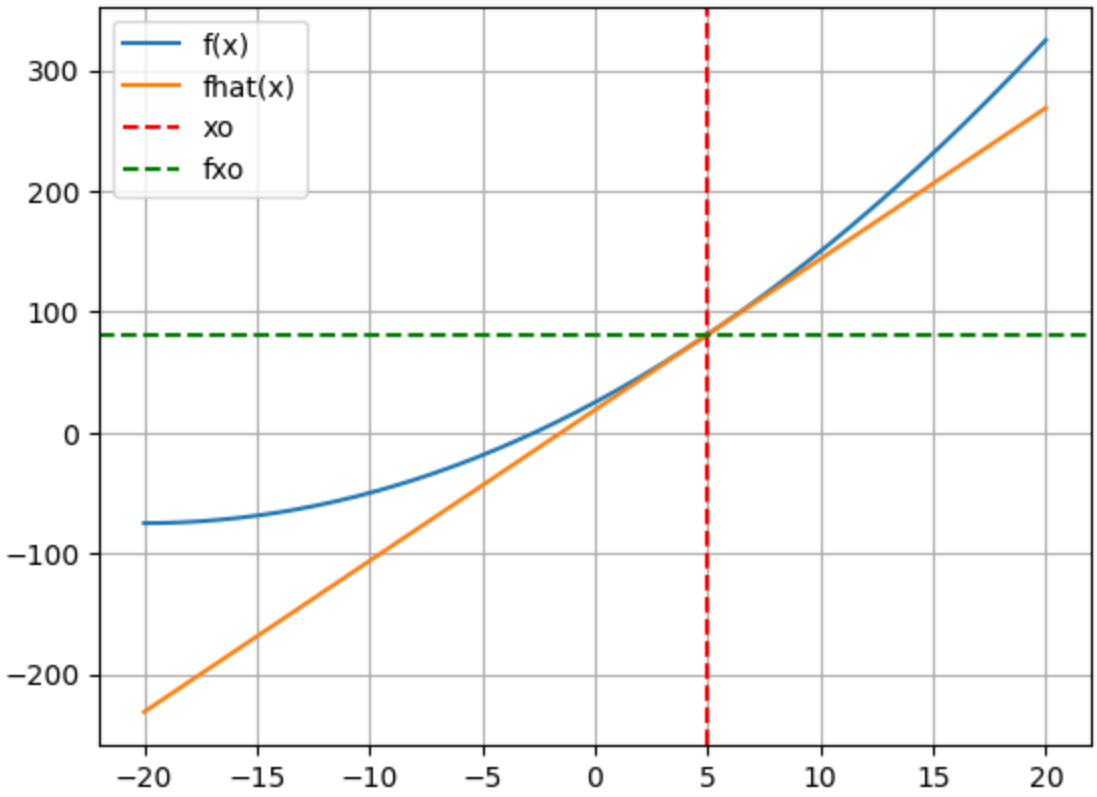
In [25]:
```
#HW1.3
xo = 5
x = xo
fxo = 1/4*(xo**2)+10*xo+25

x = np.linspace(-20, 20, 1000)

f = 1/4*(x**2)+10*x+25
fhat = ((10 + 0.5*xo)*x + (25 + 1/4 * xo**2 - 1/2 * xo**2))


plt.plot(x, f)
plt.plot(x, fhat)
plt.axvline(x=xo, color='red', linestyle='--')
plt.axhline(y=fxo, color='green', linestyle='--')

plt.legend(['f(x)', 'fhat(x)', 'xo', 'fxo'])
plt.grid()
plt.show()
```


f(x)
fhat(x)
xo
fxo
300
200
100
0
−100
−200
−20
−15
−10
−5
0
5
10
15
20