S6

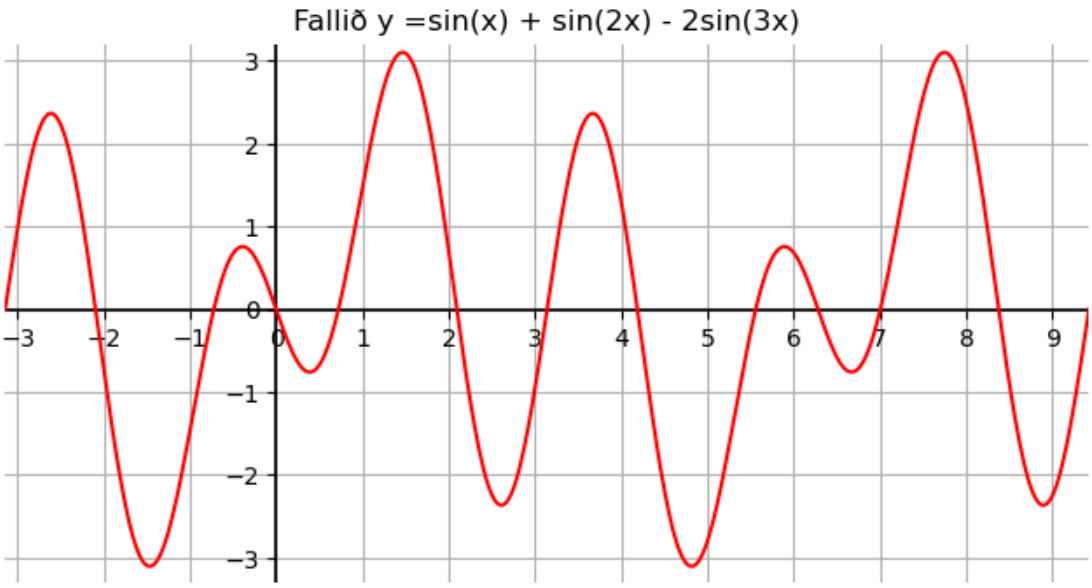
February 20, 2023

0.1 22. Sínussveiflur

[228]:
```
from math import sin, pi
import matplotlib.pyplot as plt
import numpy as np
from scipy import interpolate
def f(x):
    return sin(x) +  sin(2*x)-2*sin(3*x)
fig = plt.figure(figsize=(8,4))
ax = fig.add_subplot(1, 1, 1)
ax.spines['left'].set_position('zero')
ax.spines['bottom'].set_position('zero')
plt.xlim([-pi, 3*pi])
plt.ylim([-3.3, 3.2])
plt.xticks(np.arange(-3,10,1))
plt.yticks(np.arange(-3,3.1,1))
plt.axvline(lw=1.2, c='k')
plt.axhline(lw=1.2, c='k')
plt.grid(True)
plt.box(False)
x=np.linspace(-pi,3*pi,500)
y=[f(xi) for xi in x]
bspline = interpolate.make_interp_spline(x, y)
y_new = bspline(x)
plt.title("Fallið y =sin(x) + sin(2x) - 2sin(3x)")

plt.plot(x,y, c='r')

plt.show()
```



0.2 23. Málmavinnsla

0.2.1 1.

[545]:
```
def number(k):
    if k%2==0:
        return int((((k+1)*(k+2)*(k+3))/6)+(k/2-1))
    else:
        return int((((k+1)*(k+2)*(k+3))/6)-2)
print("k          Noble gas")
for i in range(1,8):
    print(f"{i:<10} {number(i)}")
```

```
k          Noble gas
1          2
2          10
3          18
4          36
5          54
6          86
7          118
```

0.2.2 2.

[558]:
```
def lota(s):
    if s>118:
        raise ValueError("Last element on the periodic table is Oganesson with␣
 ↪the element number 118.")
```

```
    k = 0
    while s > number(k):
        k += 1
    return k

def flokkur(y):
    if y == 1:
        return 1
    elif 1 < y <= number(lota(y)-1)+2:
        return y - number(lota(y)-1)
    else:
        return max(3,18 + y - number(lota(y)))

print("Frumefni     Flokkur     Lota")
for i in range(10,111,10):
    print(str(i).ljust(14), str(flokkur(i)).ljust(11), str(lota(i)))
```

```
4
Frumefni     Flokkur     Lota
10             18          2
20             2           4
30             12          4
40             4           5
50             14          5
60             3           6
70             3           6
80             12          6
90             3           7
100            3           7
110            10          7
```

0.2.3 3.

[350]:
```
def íslenska(s):
    """notað sem 'key' í sort eða sorted til að raða í íslenska stafrófsröð,
    t.d. print(sorted(['ár','bára','bali','akur'], key=íslenska))"""
    return [íslenska.k.get(c.lower(),0) for c in s]
íslenska.a = list('0123456789aábcdðeéfghiíjklmnoópqrstuúvwxyýzþæö')
íslenska.k = dict(zip(íslenska.a, range(1,len(íslenska.a)+1)))


file = "https://cs.hi.is/python/allir-malmar.txt"
(x,y,z,a,b,c) = np.loadtxt(file, dtype=str, delimiter=";", skiprows=1).T

Edlisthyng = np.char.replace(a, ',', '.')
Edlisthyngd = Edlisthyng.astype(float)
Takn = x.astype(str)
```

```
Malmur = y.astype(str)
Saetistala = z.astype(int)
Braedslumark = b.astype(int)
Enska = c.astype(str)

SortedList = sorted(Dictionary,key=íslenska)
SortedDict = {i: Dictionary[i] for i in SortedList}

print("Íslenska      Enska")
for i in SortedDict:
    print (i.capitalize().ljust(12), SortedDict[i])
```

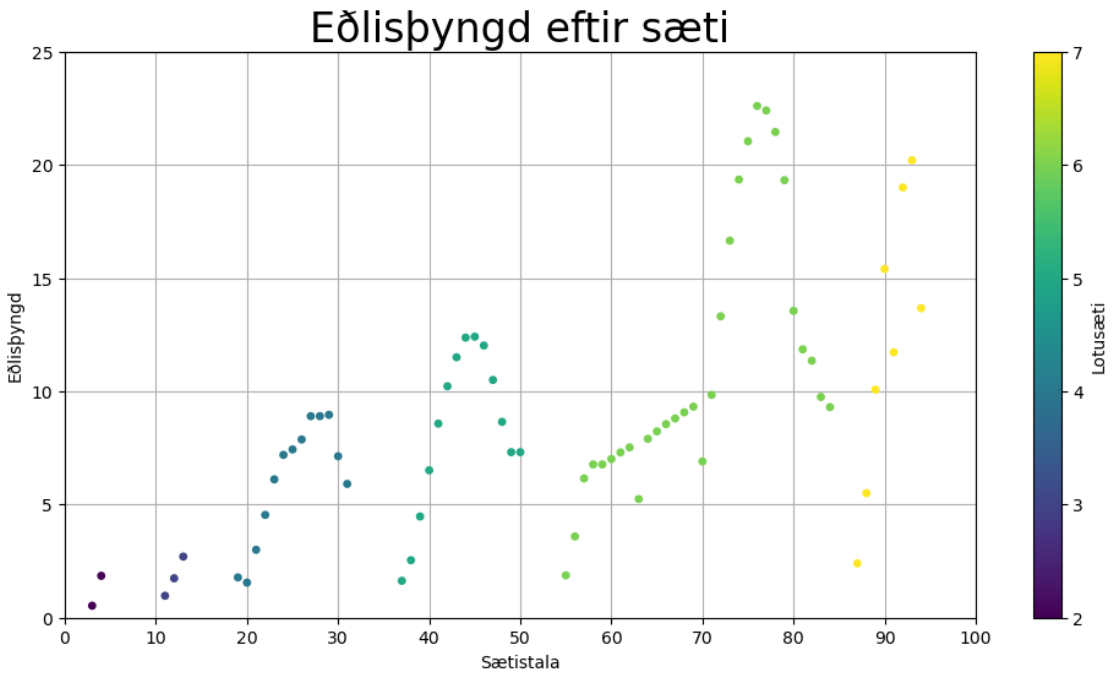
```
Íslenska      Enska
Aktín         Actinium
Ál            Aluminum
Barín         Barium
Beryllín      Beryllium
Bismút        Bismuth
Blý           Lead
Dysprósín     Dysprosium
Erbín         Erbium
Evrópín       Europium
Fransín       Francium
Gadólín       Gadolinium
Gallín        Gallium
Gull          Gold
Hafnín        Hafnium
Hólmín        Holmium
Indín         Indium
Iridín        Iridium
Járn          Iron
Kadmín        Cadmium
Kalín         Potassium
Kalsín        Calcium
Kopar         Copper
Kóbalt        Cobalt
Króm          Chromium
Kvikasilfur   Mercury
Lantan        Lanthanum
Lítín         Lithium
Lútetín       Lutetium
Magnesín      Magnesium
Mangan        Manganese
Mólýbden      Molybdenum
Natrín        Sodium
Neódým        Neodymium
Neptún        Neptunium
```

```
Nikkel       Nickel
Níóbín       Niobium
Osmín        Osmium
Palladín     Palladium
Platína      Platinum
Plúton       Plutonium
Pólon        Polonium
Praseódým    Praseodymium
Prometín     Promethium
Prótaktín    Protactinium
Radín        Radium
Renín        Rhenium
Ródín        Rhodium
Rúbidín      Rubidium
Rúþen        Ruthenium
Samarín      Samarium
Serín        Cerium
Sesín        Cesium
Silfur       Silver
Sink         Zinc
Sirkon       Zirconium
Skandín      Scandium
Strontín     Strontium
Tantal       Tantalum
Teknetín     Technetium
Terbín       Terbium
Tin          Tin
Títan        Titanium
Túlín        Thulium
Úran         Uranium
Vanadín      Vanadium
Volfram      Tungsten
Ytterbín     Ytterbium
Yttrín       Yttrium
Þallín       Thallium
Þórín        Thorium
```

0.2.4 4.

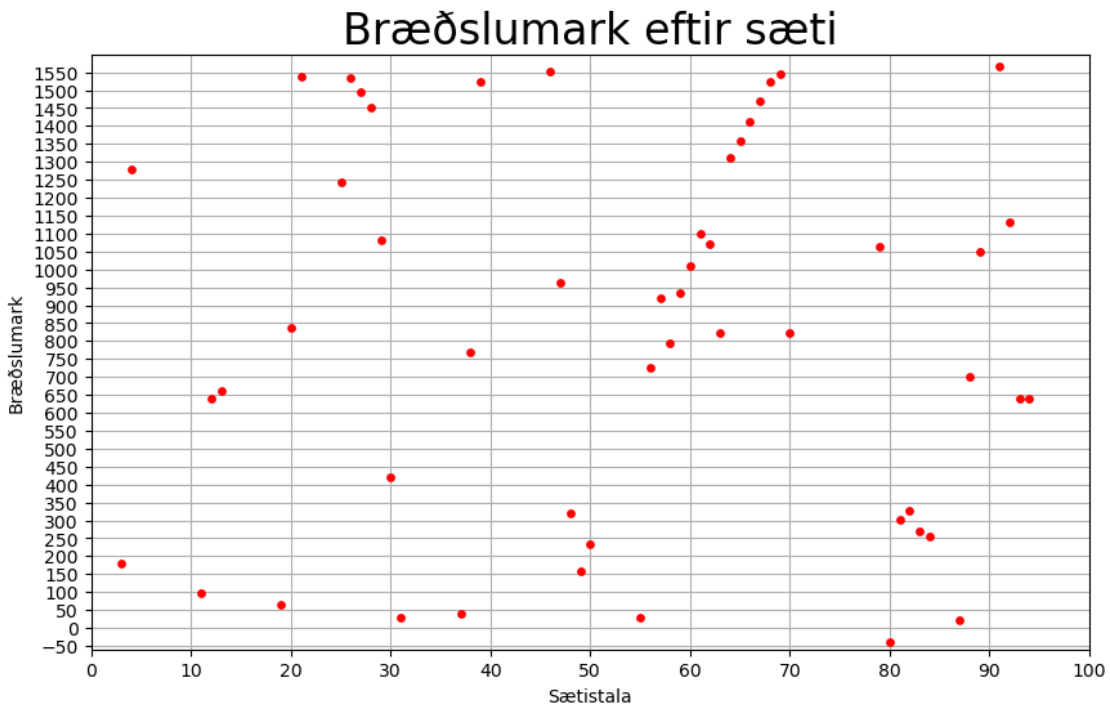
[573]:
```
import matplotlib.pyplot as plt
Saeti = [lota(i) for i in Saetistala]
plt.figure(figsize=(12,6))
plt.grid(True)
plt.xlim(0,100)
plt.ylim(0,25)
plt.xticks(np.arange(0,101, 10))
plt.xlabel('Sætistala')
```

```
plt.ylabel('Eðlisþyngd')
plt.title("Eðlisþyngd eftir sæti", size=24)
plt.scatter(Saetistala, Edlisthyngd, c=Saeti, zorder=3, s=15)
plt.colorbar(label="Lotusæti")
plt.show()
```



0.2.5 5.

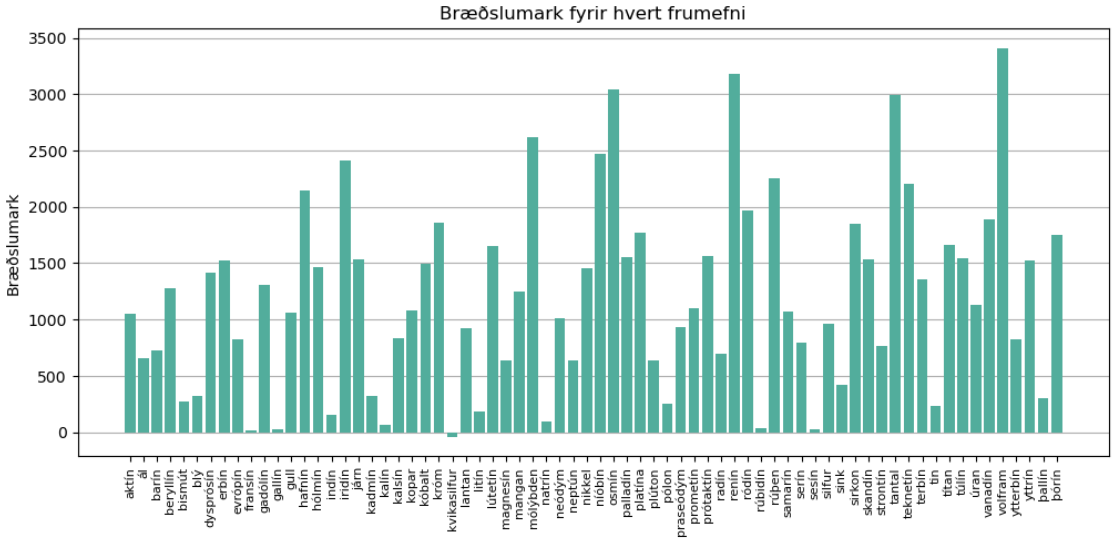
[310]:
```
plt.figure(figsize=(10,6))
plt.grid(True)
plt.xlim(0,100)
plt.ylim(-60,1600)
plt.xticks(np.arange(0,101, 10))
plt.xlabel('Sætistala')
plt.ylabel('Bræðslumark')
plt.yticks(np.arange(-50, 1600, 50))
plt.title("Bræðslumark eftir sæti", size=24)
plt.scatter(Saetistala, Braedslumark, zorder=3, s=15, c="r")
plt.show()
```



[343]:
```
Dictionary = dict(zip(Malmur,Enska))
BraedsluNafn = dict(zip(Malmur, Braedslumark))

SortedList = sorted(BraedsluNafn, key=íslenska)
SortedDict = {i: BraedsluNafn[i] for i in SortedList}

plt.figure(figsize=(12,5))
plt.grid(True, axis='y')
plt.bar(SortedList, SortedDict.values(), color='#52ad9c', linewidth=0.6,␣
↪zorder=3)
plt.xticks(rotation=90, size=8)
plt.ylabel('Bræðslumark')
plt.title('Bræðslumark fyrir hvert frumefni')
plt.show()
```


Bræðslumark fyrir hvert frumefni
Bræðslumark
3500
3000
2500
2000
1500
1000
500
0
aktín
ál
barín
beryllín
bismút
blý
dýsprósín
erbín
evrópín
fransín
gadólín
gallín
gull
hafnín
hólmín
indín
iridín
járn
kadmín
kalín
kalsín
kopar
kóbalt
króm
kvikasilfur
lantan
litín
lútetín
magnesín
mangan
mólýbden
natrín
neódým
neptún
nikkel
níóbín
osmín
palladín
platína
plúton
pólon
praseódým
prómetín
protaktín
radín
renín
ródín
rúbidín
rúben
samarín
serín
sesín
silfur
sink
sirkon
skandín
strontín
tantal
teknetín
terbín
tin
títan
túlín
úran
vanadín
volfram
ytterbín
yttrín
þallín
þórín