Importing all required libraries

In [1]:

```
import math
import numpy
import random
import matplotlib.pyplot as plt
```

In [2]:

```
#constants
defiters = 1000
```

In [8]:

```
#sum of series
def calculate_sum():
    return a/(1-r)
def compute_sum(srs):
    return sum(srs)
def getseries(iters = defiters):
    seris = []
    for it in range(iters):
        seris.append(a*(r**(it)))
    return seris
def log(n):
    return math.log(n)
```

In [33]:

```
#common ratio of infinite series
r = 0.5

#initial term of series
a = 2

iterate_no = 1000

calculated_sum_list = []
computed_sum_list = []
common_ratio_list = []
error_diff_list = []

while r<=1.5:
    srs = getseries(iterate_no)
    cmpsum = compute_sum(srs)
    clcsum = calculate_sum()
    error_diff = clcsum - cmpsum
    calculated_sum_list.append(clcsum)
    computed_sum_list.append(cmpsum)
    common_ratio_list.append(r)
    error_diff_list.append(abs(error_diff))
    pressrs = " + ".join(list(map(lambda x:str(round(x, 3)),srs))[:5])
    print(f"""[r={round(r,3)}]
    {pressrs} + ... ∞({iterate_no})
        Computed by iteration => {round(cmpsum, 3)}
        Calculated(1/a-r) =>{round(clcsum, 3)}
        Error=>{round(error_diff, 3)}]\n""")
    r+=0.02
    pass


#Graph Analysis
plt.plot(calculated_sum_list, computed_sum_list)
plt.xlabel("Calculated Sum")
plt.ylabel("Computed Sum")
```

```
plt.show()

plt.plot(common_ratio_list, error_diff_list)
plt.xlabel("R")
plt.ylabel("Error Modulus")
plt.show()
```

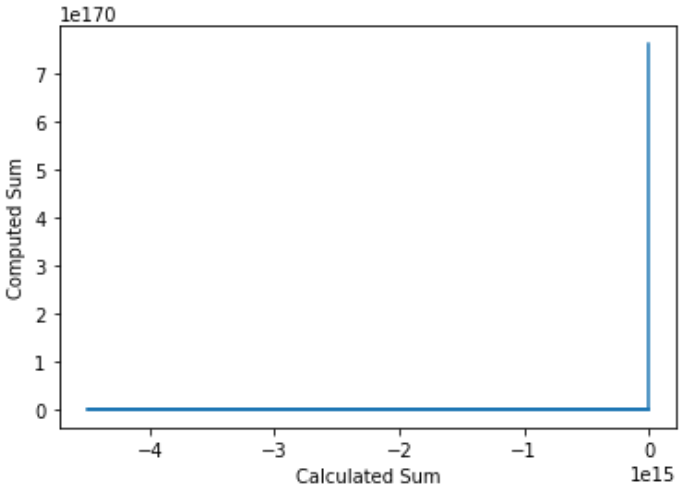
```
[r=0.5]
    2.0 + 1.0 + 0.5 + 0.25 + 0.125 + ... ∞(1000)
        Computed by iteration => 4.0
        Calculated(1/a-r) =>4.0
        Error=>0.0]

[r=0.52]
    2.0 + 1.04 + 0.541 + 0.281 + 0.146 + ... ∞(1000)
        Computed by iteration => 4.167
        Calculated(1/a-r) =>4.167
        Error=>0.0]

[r=0.54]
    2.0 + 1.08 + 0.583 + 0.315 + 0.17 + ... ∞(1000)
        Computed by iteration => 4.348
        Calculated(1/a-r) =>4.348
        Error=>0.0]

[r=0.56]
    2.0 + 1.12 + 0.627 + 0.351 + 0.197 + ... ∞(1000)
        Computed by iteration => 4.545
        Calculated(1/a-r) =>4.545
        Error=>0.0]

[r=0.58]
    2.0 + 1.16 + 0.673 + 0.39 + 0.226 + ... ∞(1000)
        Computed by iteration => 4.762
        Calculated(1/a-r) =>4.762
        Error=>0.0]

[r=0.6]
    2.0 + 1.2 + 0.72 + 0.432 + 0.259 + ... ∞(1000)
        Computed by iteration => 5.0
        Calculated(1/a-r) =>5.0
        Error=>0.0]

[r=0.62]
    2.0 + 1.24 + 0.769 + 0.477 + 0.296 + ... ∞(1000)
        Computed by iteration => 5.263
        Calculated(1/a-r) =>5.263
        Error=>-0.0]

[r=0.64]
    2.0 + 1.28 + 0.819 + 0.524 + 0.336 + ... ∞(1000)
        Computed by iteration => 5.556
        Calculated(1/a-r) =>5.556
        Error=>0.0]

[r=0.66]
    2.0 + 1.32 + 0.871 + 0.575 + 0.379 + ... ∞(1000)
        Computed by iteration => 5.882
        Calculated(1/a-r) =>5.882
        Error=>0.0]

[r=0.68]
    2.0 + 1.36 + 0.925 + 0.629 + 0.428 + ... ∞(1000)
        Computed by iteration => 6.25
        Calculated(1/a-r) =>6.25
        Error=>0.0]

[r=0.7]
    2.0 + 1.4 + 0.98 + 0.686 + 0.48 + ... ∞(1000)
        Computed by iteration => 6.667
        Calculated(1/a-r) =>6.667
        Error=>0.0]
```

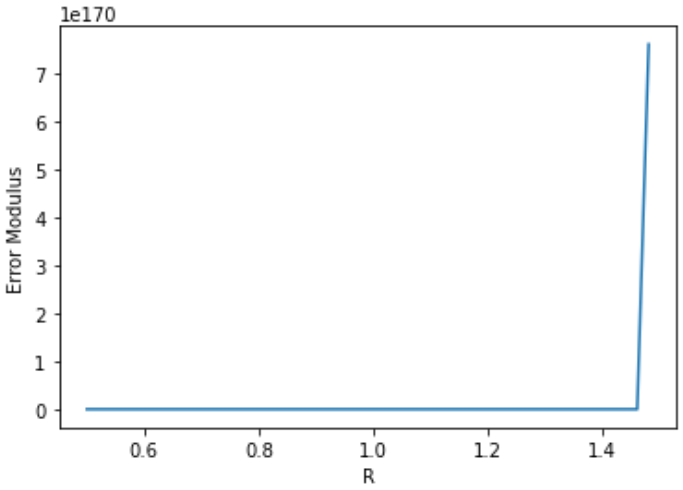
```
[r=0.72]
    2.0 + 1.44 + 1.037 + 0.746 + 0.537 + ... ∞(1000)
        Computed by iteration => 7.143
        Calculated(1/a-r) =>7.143
        Error=>0.0]

[r=0.74]
    2.0 + 1.48 + 1.095 + 0.81 + 0.6 + ... ∞(1000)
        Computed by iteration => 7.692
        Calculated(1/a-r) =>7.692
        Error=>0.0]

[r=0.76]
    2.0 + 1.52 + 1.155 + 0.878 + 0.667 + ... ∞(1000)
        Computed by iteration => 8.333
        Calculated(1/a-r) =>8.333
        Error=>0.0]

[r=0.78]
    2.0 + 1.56 + 1.217 + 0.949 + 0.74 + ... ∞(1000)
        Computed by iteration => 9.091
        Calculated(1/a-r) =>9.091
        Error=>0.0]

[r=0.8]
    2.0 + 1.6 + 1.28 + 1.024 + 0.819 + ... ∞(1000)
        Computed by iteration => 10.0
        Calculated(1/a-r) =>10.0
        Error=>0.0]

[r=0.82]
    2.0 + 1.64 + 1.345 + 1.103 + 0.904 + ... ∞(1000)
        Computed by iteration => 11.111
        Calculated(1/a-r) =>11.111
        Error=>0.0]

[r=0.84]
    2.0 + 1.68 + 1.411 + 1.185 + 0.996 + ... ∞(1000)
        Computed by iteration => 12.5
        Calculated(1/a-r) =>12.5
        Error=>-0.0]

[r=0.86]
    2.0 + 1.72 + 1.479 + 1.272 + 1.094 + ... ∞(1000)
        Computed by iteration => 14.286
        Calculated(1/a-r) =>14.286
        Error=>0.0]

[r=0.88]
    2.0 + 1.76 + 1.549 + 1.363 + 1.199 + ... ∞(1000)
        Computed by iteration => 16.667
        Calculated(1/a-r) =>16.667
        Error=>0.0]

[r=0.9]
    2.0 + 1.8 + 1.62 + 1.458 + 1.312 + ... ∞(1000)
        Computed by iteration => 20.0
        Calculated(1/a-r) =>20.0
        Error=>0.0]

[r=0.92]
    2.0 + 1.84 + 1.693 + 1.557 + 1.433 + ... ∞(1000)
        Computed by iteration => 25.0
        Calculated(1/a-r) =>25.0
        Error=>0.0]

[r=0.94]
    2.0 + 1.88 + 1.767 + 1.661 + 1.561 + ... ∞(1000)
        Computed by iteration => 33.333
        Calculated(1/a-r) =>33.333
        Error=>0.0]
```

```
[r=0.96]
    2.0 + 1.92 + 1.843 + 1.769 + 1.699 + ... ∞(1000)
        Computed by iteration => 50.0
        Calculated(1/a-r) =>50.0
        Error=>0.0]

[r=0.98]
    2.0 + 1.96 + 1.921 + 1.882 + 1.845 + ... ∞(1000)
        Computed by iteration => 100.0
        Calculated(1/a-r) =>100.0
        Error=>0.0]

[r=1.0]
    2.0 + 2.0 + 2.0 + 2.0 + 2.0 + ... ∞(1000)
        Computed by iteration => 2000.0
        Calculated(1/a-r) =>-4503599627370496.0
        Error=>-4503599627372496.0]

[r=1.02]
    2.0 + 2.04 + 2.081 + 2.122 + 2.165 + ... ∞(1000)
        Computed by iteration => 39826465065.83
        Calculated(1/a-r) =>-100.0
        Error=>-39826465165.83]

[r=1.04]
    2.0 + 2.08 + 2.163 + 2.25 + 2.34 + ... ∞(1000)
        Computed by iteration => 5.398949970835181e+18
        Calculated(1/a-r) =>-50.0
        Error=>-5.398949970835181e+18]

[r=1.06]
    2.0 + 2.12 + 2.247 + 2.382 + 2.525 + ... ∞(1000)
        Computed by iteration => 6.741305519692215e+26
        Calculated(1/a-r) =>-33.333
        Error=>-6.741305519692215e+26]

[r=1.08]
    2.0 + 2.16 + 2.333 + 2.519 + 2.721 + ... ∞(1000)
        Computed by iteration => 6.632778518913204e+34
        Calculated(1/a-r) =>-25.0
        Error=>-6.632778518913204e+34]

[r=1.1]
    2.0 + 2.2 + 2.42 + 2.662 + 2.928 + ... ∞(1000)
        Computed by iteration => 4.9398658360140194e+42
        Calculated(1/a-r) =>-20.0
        Error=>-4.9398658360140194e+42]

[r=1.12]
    2.0 + 2.24 + 2.509 + 2.81 + 3.147 + ... ∞(1000)
        Computed by iteration => 2.7534133882052073e+50
        Calculated(1/a-r) =>-16.667
        Error=>-2.7534133882052073e+50]

[r=1.14]
    2.0 + 2.28 + 2.599 + 2.963 + 3.378 + ... ∞(1000)
        Computed by iteration => 1.1475015912739534e+58
        Calculated(1/a-r) =>-14.286
        Error=>-1.1475015912739534e+58]

[r=1.16]
    2.0 + 2.32 + 2.691 + 3.122 + 3.621 + ... ∞(1000)
        Computed by iteration => 3.5883867131341797e+65
        Calculated(1/a-r) =>-12.5
        Error=>-3.5883867131341797e+65]

[r=1.18]
    2.0 + 2.36 + 2.785 + 3.286 + 3.878 + ... ∞(1000)
        Computed by iteration => 8.467687006334196e+72
        Calculated(1/a-r) =>-11.111
        Error=>-8.467687006334196e+72]
```

```
[r=1.2]
    2.0 + 2.4 + 2.88 + 3.456 + 4.147 + ... ∞(1000)
        Computed by iteration => 1.5179100891730839e+80
        Calculated(1/a-r) =>-10.0
        Error=>-1.5179100891730839e+80]

[r=1.22]
    2.0 + 2.44 + 2.977 + 3.632 + 4.431 + ... ∞(1000)
        Computed by iteration => 2.0817951364508664e+87
        Calculated(1/a-r) =>-9.091
        Error=>-2.0817951364508664e+87]

[r=1.24]
    2.0 + 2.48 + 3.075 + 3.813 + 4.728 + ... ∞(1000)
        Computed by iteration => 2.200411551440836e+94
        Calculated(1/a-r) =>-8.333
        Error=>-2.200411551440836e+94]

[r=1.26]
    2.0 + 2.52 + 3.175 + 4.001 + 5.041 + ... ∞(1000)
        Computed by iteration => 1.805517762198668e+101
        Calculated(1/a-r) =>-7.692
        Error=>-1.805517762198668e+101]

[r=1.28]
    2.0 + 2.56 + 3.277 + 4.194 + 5.369 + ... ∞(1000)
        Computed by iteration => 1.1583548254736254e+108
        Calculated(1/a-r) =>-7.143
        Error=>-1.1583548254736254e+108]

[r=1.3]
    2.0 + 2.6 + 3.38 + 4.394 + 5.712 + ... ∞(1000)
        Computed by iteration => 5.851416981985526e+114
        Calculated(1/a-r) =>-6.667
        Error=>-5.851416981985526e+114]

[r=1.32]
    2.0 + 2.64 + 3.485 + 4.6 + 6.072 + ... ∞(1000)
        Computed by iteration => 2.34321005988868e+121
        Calculated(1/a-r) =>-6.25
        Error=>-2.34321005988868e+121]

[r=1.34]
    2.0 + 2.68 + 3.591 + 4.812 + 6.448 + ... ∞(1000)
        Computed by iteration => 7.487717373269895e+127
        Calculated(1/a-r) =>-5.882
        Error=>-7.487717373269895e+127]

[r=1.36]
    2.0 + 2.72 + 3.699 + 5.031 + 6.842 + ... ∞(1000)
        Computed by iteration => 1.9214799854302076e+134
        Calculated(1/a-r) =>-5.556
        Error=>-1.9214799854302076e+134]

[r=1.38]
    2.0 + 2.76 + 3.809 + 5.256 + 7.253 + ... ∞(1000)
        Computed by iteration => 3.9841235738308535e+140
        Calculated(1/a-r) =>-5.263
        Error=>-3.9841235738308535e+140]

[r=1.4]
    2.0 + 2.8 + 3.92 + 5.488 + 7.683 + ... ∞(1000)
        Computed by iteration => 6.7143763836868615e+146
        Calculated(1/a-r) =>-5.0
        Error=>-6.7143763836868615e+146]

[r=1.42]
    2.0 + 2.84 + 4.033 + 5.727 + 8.132 + ... ∞(1000)
        Computed by iteration => 9.249645498834978e+152
        Calculated(1/a-r) =>-4.762
        Error=>-9.249645498834978e+152]
```

```
[r=1.44]
    2.0 + 2.88 + 4.147 + 5.972 + 8.6 + ... ∞(1000)
        Computed by iteration => 1.0472959267329078e+159
        Calculated(1/a-r) =>-4.545
        Error=>-1.0472959267329078e+159]

[r=1.46]
    2.0 + 2.92 + 4.263 + 6.224 + 9.087 + ... ∞(1000)
        Computed by iteration => 9.797785975459695e+164
        Calculated(1/a-r) =>-4.348
        Error=>-9.797785975459695e+164]

[r=1.48]
    2.0 + 2.96 + 4.381 + 6.484 + 9.596 + ... ∞(1000)
        Computed by iteration => 7.612094185706564e+170
        Calculated(1/a-r) =>-4.167
        Error=>-7.612094185706564e+170]
```





In [ ]: