In [2]:

```
# from lab3
import os
cpu = input('enter CPU number (0/1)?')
str = "taskset -c "+cpu+" python3 fib.py"
print(str)
os.system(str)
```

```
enter CPU number (0/1)?1
taskset -c 1 python3 fib.py
time spent: 4.410743713378906e-05
```

Out[2]:

```
0
```

In [11]:

```
# use psutil
import psutil, time

# Create a function to get the CPU usage
def get_cpu_usage():
  """Returns the CPU usage as a percentage."""
  return psutil.cpu_percent()

# Create a loop to continuously monitor the CPU usage
while True:
  # Get the CPU usage
  cpu_usage = get_cpu_usage()

  # Print the CPU usage to the console
  print(f"CPU usage: {cpu_usage}%")

  # Sleep for 1 second
  time.sleep(1)
```

```
CPU usage: 1.1%
CPU usage: 5.5%
CPU usage: 2.0%
```

```
---------------------------------------------------------------------------
KeyboardInterrupt                         Traceback (most recent call last)
Input In [11], in <cell line: 10>()
     15 print(f"CPU usage: {cpu_usage}%")
     17 # Sleep for 1 second
---> 18 time.sleep(1)

KeyboardInterrupt: 
```

In [ ]:

```
#Implement ELAPSED TIME
import time
start = time.time()
#<<<< tratar fibonacci con argumento de entrada que tome valores 1-30
time.sleep(1)
end = time.time()
print(end - start)
```

In [9]:

```
#new /clock_example0/cycletime2.c version2
# /home/xilinx/jupyter_notebooks/RLS/Assignm3_PMU/clock_example0#
# https://docs.python.org/3/library/ctypes.html

%reset -f
import ctypes, time
```

```
_libInC = ctypes.CDLL('./clock_example0/libMyLib.so')
val = _libInC.version();print("Library version: "+ str(val))

for n in range(5):
    _libInC.init_cntrs(1,0)
    #time.sleep(1)
    val = ctypes.c_uint(_libInC.gcyclec()).value;print(val)
```

```
Library version: 671
55033
6486
5873
5771
6026
```

In [ ]:

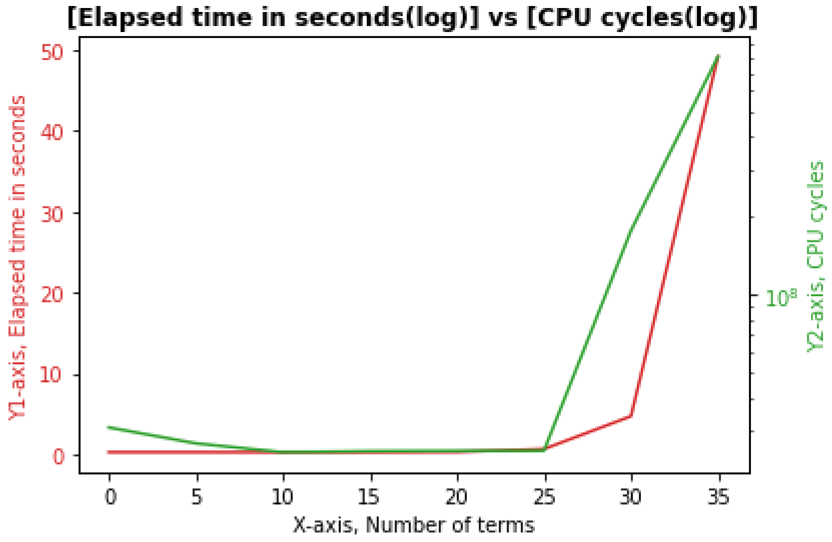
```
#new /clock_example0/cycletime2.c version2
# /home/xilinx/jupyter_notebooks/RLS/Assignm3_PMU/clock_example0#
# https://docs.python.org/3/library/ctypes.html

%reset -f
import ctypes, time
_libInC = ctypes.CDLL('./clock_example0/libMyLib.so')
val = _libInC.version();print("Library version: "+ str(val))

for n in range(5):
    _libInC.init_cntrs(1,0)
    #time.sleep(1)
    val = ctypes.c_uint(_libInC.gcyclec()).value;print(val)
```

In [8]:

```
# Part A3.2: Comparing and Gathering Data, (running fibonacci sequence)
%reset -f
CPU, TERMSary, ELAPSEDary, CYCLESary = "1", [], [], []

import os, ctypes, time, math;import matplotlib.pyplot as plt

def Average(lst):
    return sum(lst) / len(lst)

_libInC = ctypes.CDLL('./clock_example0/libMyLib.so')
val = _libInC.version();print("Library version: "+ str(val))
for NumberOfTerms in range(0,40,5):
    cmd = "taskset -c "+CPU+" python3 fib.py "+ str(NumberOfTerms);print (cmd)
    start = time.time()
    _libInC.init_cntrs(1,0)
    os.system(cmd)
    lst = []
    for n in range(4):
        cycles = ctypes.c_uint(_libInC.gcyclec()).value
        lst.append(cycles)
    ave = Average(lst)
    end = time.time();elapsed = end - start;elapsed = round(elapsed, 7)
    print(cmd+"-> NumberOfTerms: "+ str(NumberOfTerms)+ " -> Elapsed time = " +str(ela
          +", cycles = "+str(ave))
    TERMSary.append(NumberOfTerms);ELAPSEDary.append(elapsed);CYCLESary.append(ave)
    lst = []

x = TERMSary
dataset_1 = ELAPSEDary
dataset_2 = CYCLESary
fig, ax1 = plt.subplots()
```

```python
color = 'tab:red'
ax1.set_xlabel('X-axis, Number of terms')
ax1.set_ylabel('Y1-axis, Elapsed time in seconds', color = color)
ax1.plot(x, dataset_1, color = color)
ax1.tick_params(axis ='y', labelcolor = color)
ax2 = ax1.twinx() # Adding Twin Axes to plot using dataset_2
color = 'tab:green'
ax2.set_ylabel('Y2-axis, CPU cycles', color = color)
ax2.plot(x, dataset_2, color = color)
ax2.tick_params(axis ='y', labelcolor = color)
plt.title('[Elapsed time in seconds(log)] vs [CPU cycles(log)]', fontweight ="bold")
plt.yscale("log")
plt.show()
```

```
Library version: 671
taskset -c 1 python3 fib.py 0
Please enter a positive integer
time spent: 3.9577484130859375e-05
taskset -c 1 python3 fib.py 0-> NumberOfTerms: 0 -> Elapsed time = 0.2825541, cycles
= 30899800.25
taskset -c 1 python3 fib.py 5
time spent: 4.57763671875e-05
taskset -c 1 python3 fib.py 5-> NumberOfTerms: 5 -> Elapsed time = 0.283452, cycles =
26860213.75
taskset -c 1 python3 fib.py 10
time spent: 0.00033855438232421875
taskset -c 1 python3 fib.py 10-> NumberOfTerms: 10 -> Elapsed time = 0.2810333, cycle
s = 24839358.75
taskset -c 1 python3 fib.py 15
time spent: 0.003538370132446289
taskset -c 1 python3 fib.py 15-> NumberOfTerms: 15 -> Elapsed time = 0.284327, cycles
= 25086398.5
taskset -c 1 python3 fib.py 20
time spent: 0.035907268524169922
taskset -c 1 python3 fib.py 20-> NumberOfTerms: 20 -> Elapsed time = 0.3175039, cycle
s = 25147380.5
taskset -c 1 python3 fib.py 25
time spent: 0.39580512046813965
taskset -c 1 python3 fib.py 25-> NumberOfTerms: 25 -> Elapsed time = 0.6754739, cycle
s = 25174258.25
taskset -c 1 python3 fib.py 30
time spent: 4.454235076904297
taskset -c 1 python3 fib.py 30-> NumberOfTerms: 30 -> Elapsed time = 4.7351103, cycle
s = 174938228.0
taskset -c 1 python3 fib.py 35
time spent: 48.926105976104736
taskset -c 1 python3 fib.py 35-> NumberOfTerms: 35 -> Elapsed time = 49.2074983, cycl
es = 810312796.75
```



In [21]:

```
#Cycles To Seconds Formula
f = 3e9#650000000
cycles = 100

secs=(1/( *f))*cycles

print(secs)
```

```
3.3333333333333333e-10
```

In [27]:

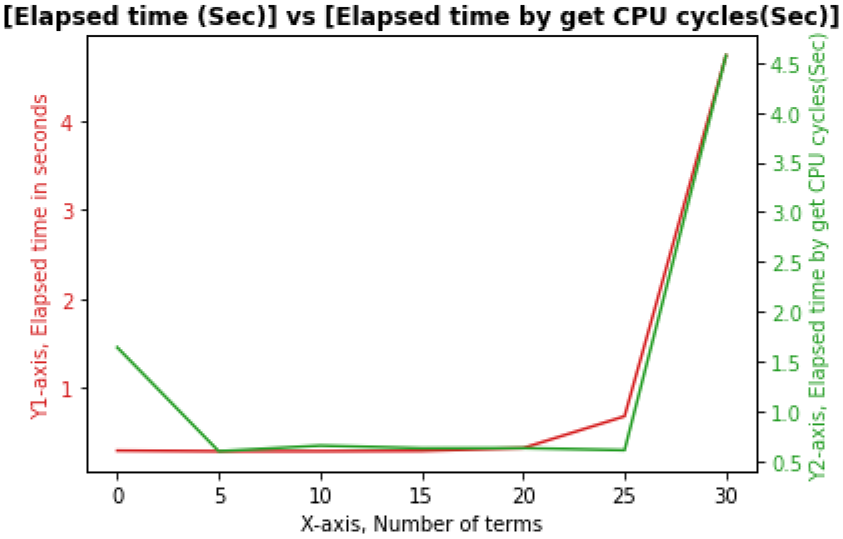
```
f = 650 000 000
JustOneCycle = 1/f #secons
print(JustOneCycle)
print("----------")
cycles = 3000000000
TimeElapsedInSeconds = cycles * JustOneCycle
print(TimeElapsedInSeconds)
```

```
3.3333333333333333e-10
----------
1.0
```

In [24]:

```
# Part A3.2: Comparing and Gathering Data, ERROR BAR (running fibonacci sequence)
%reset -f
CPU, TERMSary, ELAPSEDary, ELAPSEDCYCLESary = "1", [], [], []

import os, ctypes, time, math;import matplotlib.pyplot as plt
f = 650000
JustOneCycle = 1/f #secons

def Average(lst):
    return sum(lst) / len(lst)

_libInC = ctypes.CDLL('./clock_example0/libMyLib.so')
val = _libInC.version();print("Library version: "+ str(val))
_libInC.init_cntrs(1,1)
for NumberOfTerms in range(0,35,5):
    cmd = "taskset -c "+CPU+" python3 fib.py "+ str(NumberOfTerms);print (cmd)
    start = time.time()
    #_libInC.init_cntrs(1,1)
    StartCycles = ctypes.c_uint(_libInC.gcyclec()).value
    os.system(cmd)
    lst = []
    #for n in range(4):
    #    cycles = ctypes.c_uint(_libInC.gcyclec()).value
    #    lst.append(cycles)
    #ave = Average(lst)
    StopCycles = ctypes.c_uint(_libInC.gcyclec()).value
    ElapsedTimeCycles = StopCycles - StartCycles
    TimeElapsedInSeconds = ElapsedTimeCycles * JustOneCycle
    #TimeElapsedInSeconds = round(TimeElapsedInSeconds, 9)
    end = time.time();elapsed = end - start;elapsed = round(elapsed, 9)
    print(cmd+"-> NumberOfTerms: "+ str(NumberOfTerms)+ ":\nElapsed time = " +str(elap
          +", Elapsed Seconds by get cycles = "+str(TimeElapsedInSeconds))
    TERMSary.append(NumberOfTerms);ELAPSEDary.append(elapsed);ELAPSEDCYCLESary.append(
    lst = []

x = TERMSary
dataset_1 = ELAPSEDary
dataset_2 = ELAPSEDCYCLESary
fig, ax1 = plt.subplots()

color = 'tab:red'
ax1.set_xlabel('X-axis, Number of terms')
ax1.set_ylabel('Y1-axis, Elapsed time in seconds', color = color)
ax1.plot(x, dataset_1, color = color)
ax1.tick_params(axis ='y', labelcolor = color)
ax2 = ax1.twinx() # Adding Twin Axes to plot using dataset_2
color = 'tab:green'
ax2.set_ylabel('Y2-axis, Elapsed time by get CPU cycles(Sec)', color = color)
ax2.plot(x, dataset_2, color = color)
ax2.tick_params(axis ='y', labelcolor = color)
plt.title('[Elapsed time (Sec)] vs [Elapsed time by get CPU cycles(Sec)]', fontweight
#plt.yscale("log")
plt.show()
```

```
Library version: 671
taskset -c 1 python3 fib.py 0
Please enter a positive integer
time spent: 4.029273986816406e-05
taskset -c 1 python3 fib.py 0-> NumberOfTerms: 0:
Elapsed time = 0.288913488, Elapsed Seconds by get cycles = 1.6421061538461539
taskset -c 1 python3 fib.py 5
time spent: 4.410743713378906e-05
taskset -c 1 python3 fib.py 5-> NumberOfTerms: 5:
Elapsed time = 0.281714201, Elapsed Seconds by get cycles = 0.6000323076923078
taskset -c 1 python3 fib.py 10
time spent: 0.000339508056640625
taskset -c 1 python3 fib.py 10-> NumberOfTerms: 10:
Elapsed time = 0.281897068, Elapsed Seconds by get cycles = 0.6565969230769231
taskset -c 1 python3 fib.py 15
time spent: 0.0034394264221191406
taskset -c 1 python3 fib.py 15-> NumberOfTerms: 15:
Elapsed time = 0.285347223, Elapsed Seconds by get cycles = 0.63026
taskset -c 1 python3 fib.py 20
time spent: 0.03600001335144043
taskset -c 1 python3 fib.py 20-> NumberOfTerms: 20:
Elapsed time = 0.317011595, Elapsed Seconds by get cycles = 0.6317815384615385
taskset -c 1 python3 fib.py 25
time spent: 0.39605093002319336
taskset -c 1 python3 fib.py 25-> NumberOfTerms: 25:
Elapsed time = 0.675740004, Elapsed Seconds by get cycles = 0.6107076923076923
taskset -c 1 python3 fib.py 30
time spent: 4.460162162780762
taskset -c 1 python3 fib.py 30-> NumberOfTerms: 30:
Elapsed time = 4.741090059, Elapsed Seconds by get cycles = 4.572081538461538
```


[Elapsed time (Sec)] vs [Elapsed time by get CPU cycles(Sec)]
Y1-axis, Elapsed time in seconds
Y2-axis, Elapsed time by get CPU cycles(Sec)
X-axis, Number of terms