OPERATING SYSTEMS

Lab Assignment Sheet-1

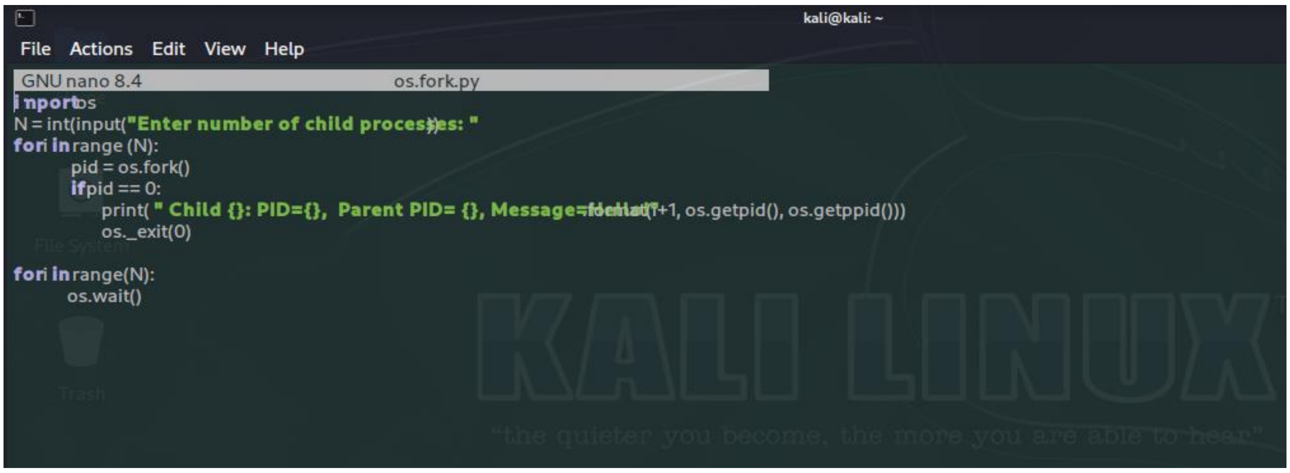
Experiment Title: Process Creation and Management Using Python OS Module

Task 1: Process Creation Utility

Write a Python program that creates N child processes using os.fork(). Each child prints:
- Its PID
- Its Parent PID
- A custom message

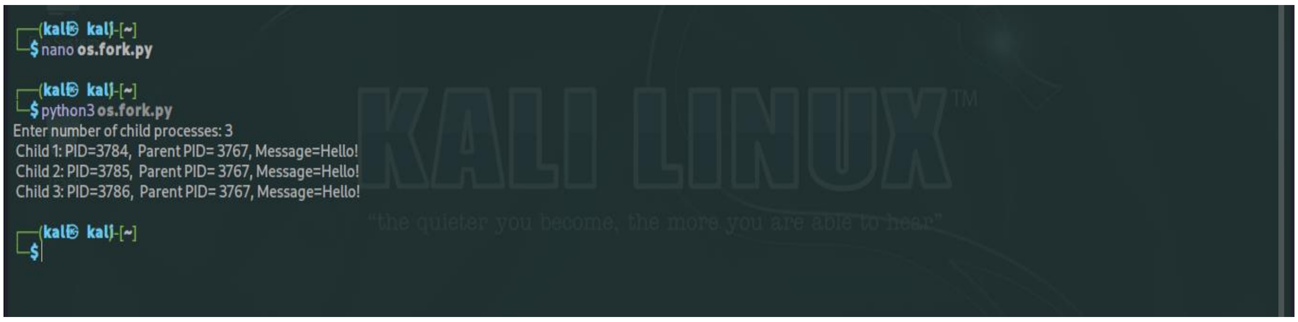
The parent should wait for all children using os.wait().

INPUT-



```
import os
N = int(input("Enter number of child processes: "))
for i in range (N):
        pid = os.fork()
        if pid == 0:
            print( " Child {}: PID={},  Parent PID= {}, Message=Hello!".format(i+1, os.getpid(), os.getppid()))
            os._exit(0)

for i in range(N):
       os.wait()
```

OUTPUT

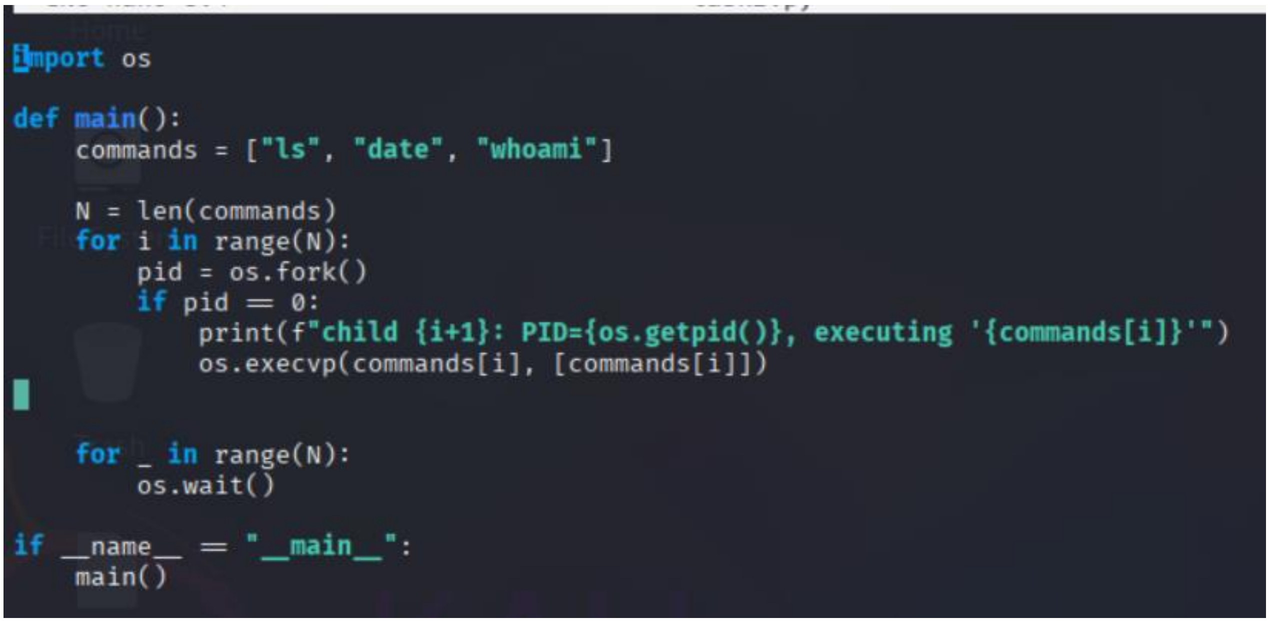


```
┌──(kali㉿ kali)-[~]
└─$ nano os.fork.py

┌──(kali㉿ kali)-[~]
└─$ python3 os.fork.py
Enter number of child processes: 3
 Child 1: PID=3784,  Parent PID= 3767, Message=Hello!
 Child 2: PID=3785,  Parent PID= 3767, Message=Hello!
 Child 3: PID=3786,  Parent PID= 3767, Message=Hello!

┌──(kali㉿ kali)-[~]
└─$ 
```

Task 2: Command Execution Using exec()

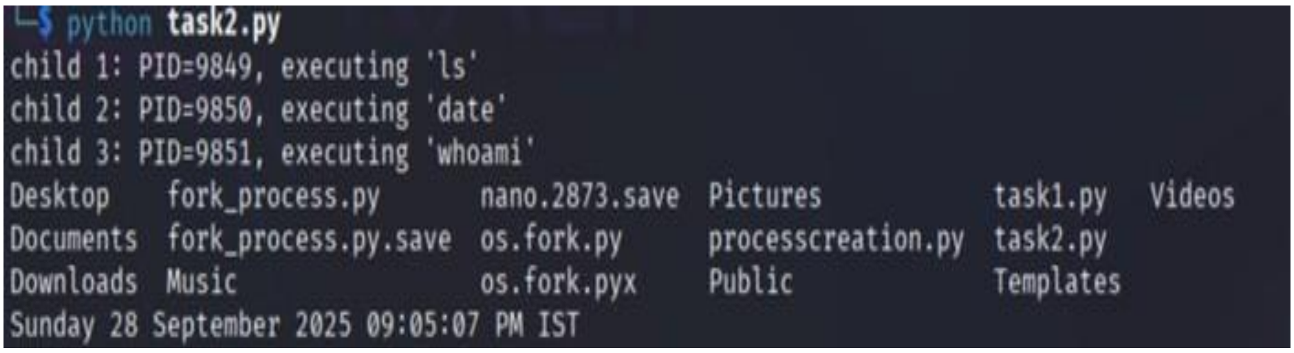
Modify Task 1 so that each child process executes a Linux command (ls, date, ps, etc.) using os.execvp() or subprocess.run().

INPUT



```
import os

def main():
    commands = ["ls", "date", "whoami"]

    N = len(commands)
    for i in range(N):
        pid = os.fork()
        if pid == 0:
            print(f"child {i+1}: PID={os.getpid()}, executing '{commands[i]}'")
            os.execvp(commands[i], [commands[i]])


    for _ in range(N):
        os.wait()

if __name__ == "__main__":
    main()
```

OUTPUT

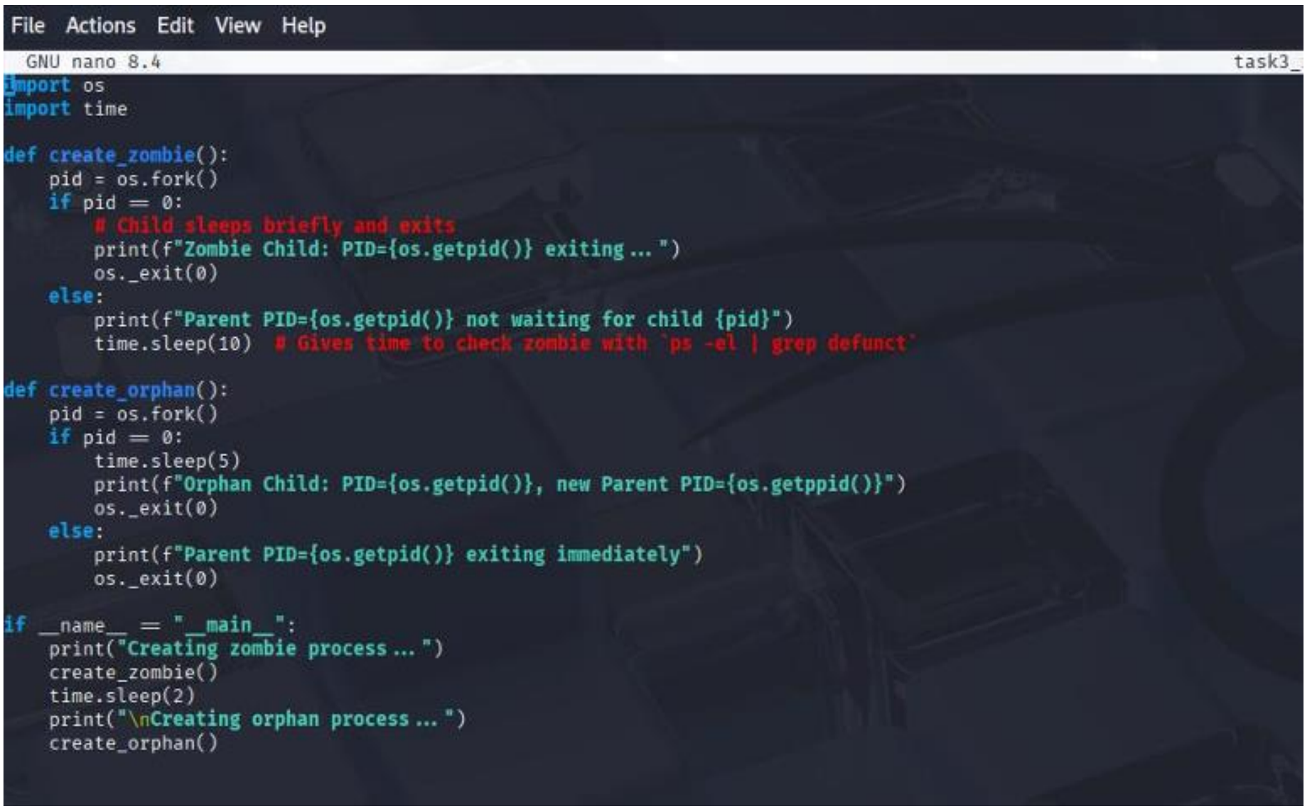


```
└─$ python task2.py
child 1: PID=9849, executing 'ls'
child 2: PID=9850, executing 'date'
child 3: PID=9851, executing 'whoami'
Desktop    fork_process.py       nano.2873.save  Pictures            task1.py   Videos
Documents  fork_process.py.save  os.fork.py      processcreation.py  task2.py
Downloads  Music                 os.fork.pyx     Public              Templates
Sunday 28 September 2025 09:05:07 PM IST
```

Task 3: Zombie & Orphan Processes

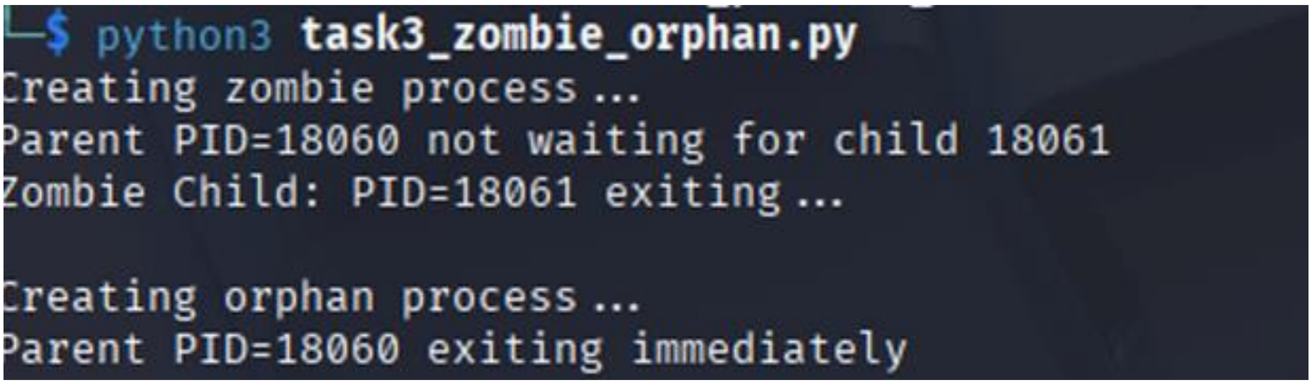
Zombie: Fork a child and skip wait() in the parent.
Orphan: Parent exits before the child finishes.
Use ps -el | grep defunct to identify zombies.

INPUT



```python
import os
import time

def create_zombie():
    pid = os.fork()
    if pid == 0:
        # Child sleeps briefly and exits
        print(f"Zombie Child: PID={os.getpid()} exiting...")
        os._exit(0)
    else:
        print(f"Parent PID={os.getpid()} not waiting for child {pid}")
        time.sleep(10)  # Gives time to check zombie with `ps -el | grep defunct`

def create_orphan():
    pid = os.fork()
    if pid == 0:
        time.sleep(5)
        print(f"Orphan Child: PID={os.getpid()}, new Parent PID={os.getppid()}")
        os._exit(0)
    else:
        print(f"Parent PID={os.getpid()} exiting immediately")
        os._exit(0)

if __name__ == "__main__":
    print("Creating zombie process...")
    create_zombie()
    time.sleep(2)
    print("\nCreating orphan process...")
    create_orphan()
```

OUTPUT

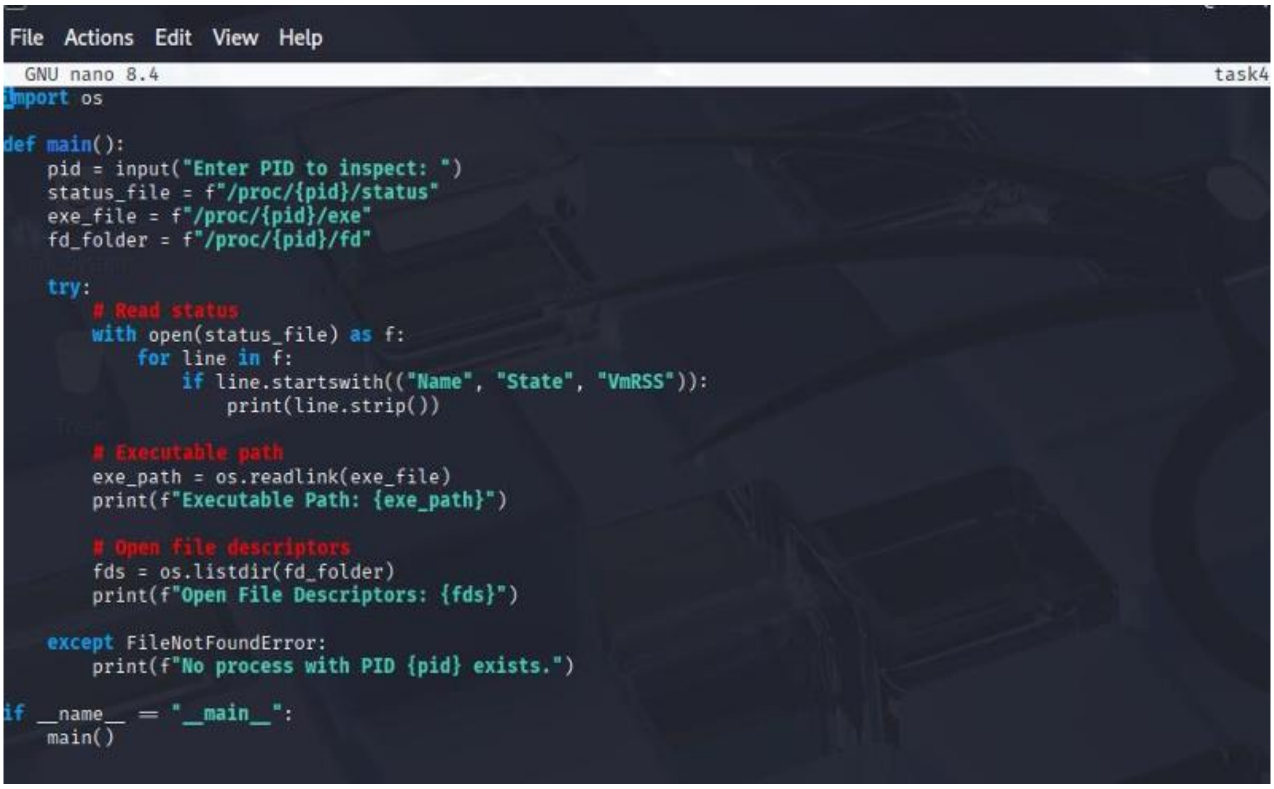


```
└─$ python3 task3_zombie_orphan.py
Creating zombie process...
Parent PID=18060 not waiting for child 18061
Zombie Child: PID=18061 exiting...

Creating orphan process...
Parent PID=18060 exiting immediately
```

Task 4: Inspecting Process Info from /proc

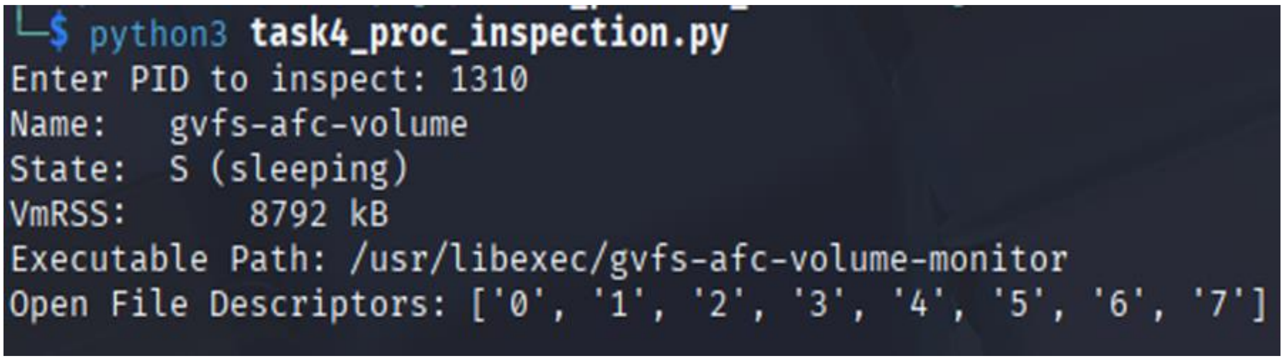
Take a PID as input. Read and print:
- Process name, state, memory usage from /proc/[pid]/status
- Executable path from /proc/[pid]/exe
- Open file descriptors from /proc/[pid]/fd

INPUT



```python
import os

def main():
    pid = input("Enter PID to inspect: ")
    status_file = f"/proc/{pid}/status"
    exe_file = f"/proc/{pid}/exe"
    fd_folder = f"/proc/{pid}/fd"

    try:
        # Read status
        with open(status_file) as f:
            for line in f:
                if line.startswith(("Name", "State", "VmRSS")):
                    print(line.strip())

        # Executable path
        exe_path = os.readlink(exe_file)
        print(f"Executable Path: {exe_path}")

        # Open file descriptors
        fds = os.listdir(fd_folder)
        print(f"Open File Descriptors: {fds}")

    except FileNotFoundError:
        print(f"No process with PID {pid} exists.")

if __name__ == "__main__":
    main()
```

OUTPUT

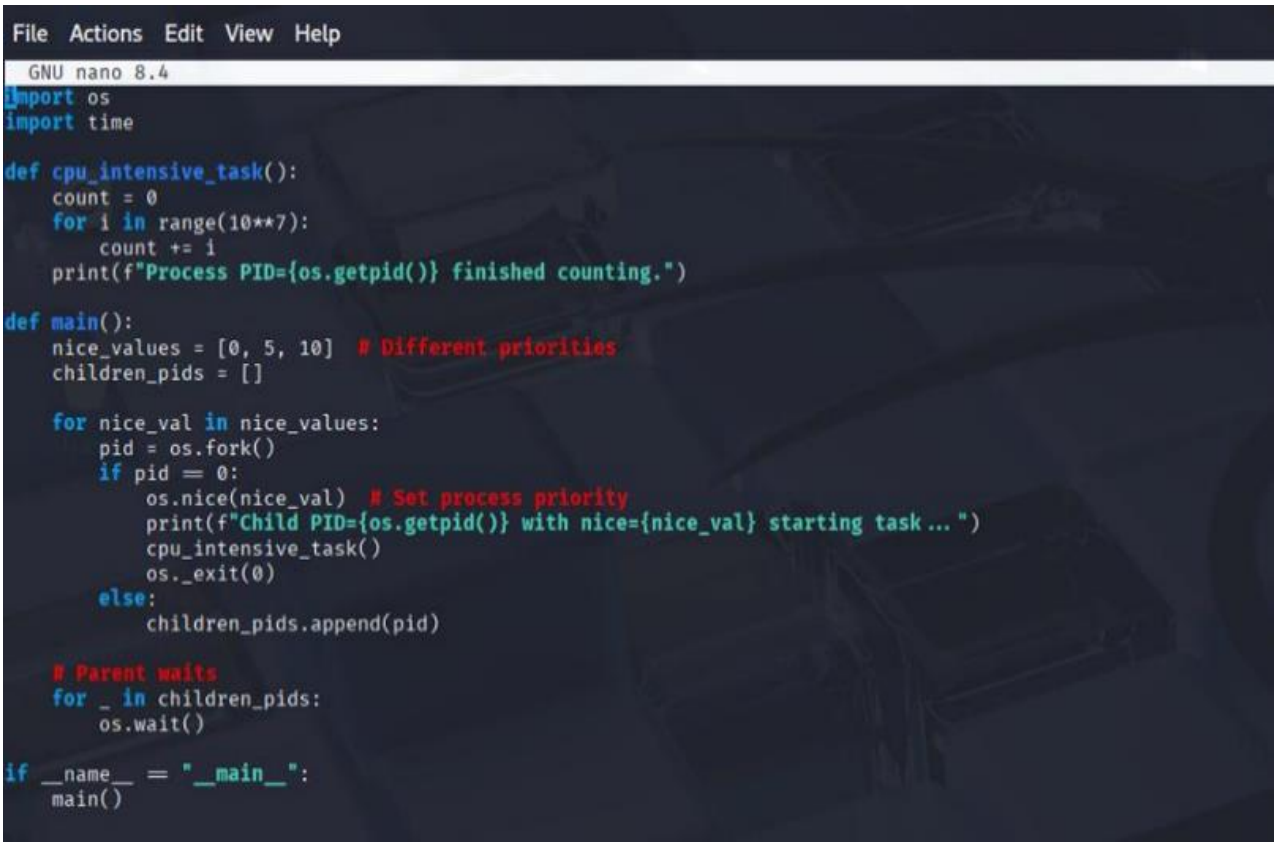


```
└─$ python3 task4_proc_inspection.py
Enter PID to inspect: 1310
Name:   gvfs-afc-volume
State:  S (sleeping)
VmRSS:      8792 kB
Executable Path: /usr/libexec/gvfs-afc-volume-monitor
Open File Descriptors: ['0', '1', '2', '3', '4', '5', '6', '7']
```

Task 5: Process Prioritization

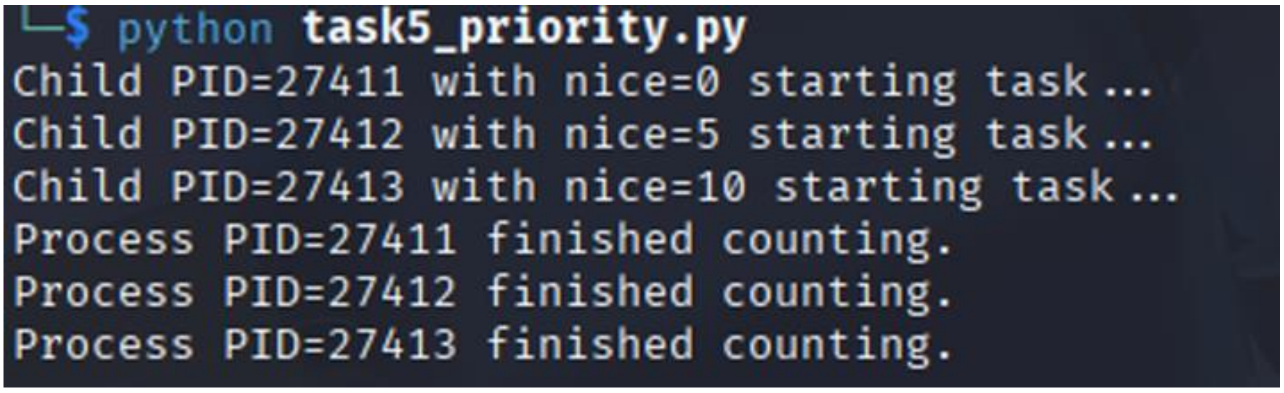
Create multiple CPU-intensive child processes. Assign different nice() values. Observe and log execution order to show scheduler impact.

INPUT



```python
import os
import time

def cpu_intensive_task():
    count = 0
    for i in range(10**7):
        count += i
    print(f"Process PID={os.getpid()} finished counting.")

def main():
    nice_values = [0, 5, 10]  # Different priorities
    children_pids = []

    for nice_val in nice_values:
        pid = os.fork()
        if pid == 0:
            os.nice(nice_val)  # Set process priority
            print(f"Child PID={os.getpid()} with nice={nice_val} starting task...")
            cpu_intensive_task()
            os._exit(0)
        else:
            children_pids.append(pid)

    # Parent waits
    for _ in children_pids:
        os.wait()

if __name__ == "__main__":
    main()
```

OUTPUT



```
└─$ python task5_priority.py
Child PID=27411 with nice=0 starting task...
Child PID=27412 with nice=5 starting task...
Child PID=27413 with nice=10 starting task...
Process PID=27411 finished counting.
Process PID=27412 finished counting.
Process PID=27413 finished counting.
```