Directions: The exam is 50 minutes long. Please read each question carefully.

EACH QUESTION IS WORTH 20 POINTS When asked to write code, you should write working Python code that has correct syntax. Please show your work and provide verbal explanations where necessary. Use the backs of the pages if needed.

Last Name: _____

First Name: _____

Student ID #: _____

Question	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total:	100	

1. (20 points) Write down the output of the following programs.

    1.
    ```
    i = 5
    while i < 100:
       print(i)
       i *= 2
    print(i)
    ```

    2.
    ```
    def f(n):
        for i in range(10):
            if i > n:
                continue
            n = n // 2
        return n

    print(f(32))
    ```

    3.
    ```
    def g(n):
       if n == 0:
          return []
       return [n % 2] + g(n // 2)

    print(g(8))
    ```

2. (20 points) Produce the following lists using for loops, while loops, or list comprehensions:

   1. `[1,1,1,1,2,2,2,2,3,3,3,3,4,4,4,4]`

   2. `[1,-1,2,-2,3,-3,4,-4,5,-5]`

   3. `[12,10,8,6,4,2,0,0,0,0]`

3. (20 points) Write down the output of the following code:

    1. (10 pts)

```
reduce(lambda x, y: x*y, range(1,6))
```

    2. (10 pts)

```
reduce(lambda a,d: 10*a+d, [1,2,3,4,5])
```

4. (20 points) Write down a Python function `spread(xs)` that will return the difference between the largest and smallest element of a list `xs`. Example:

   `spread([1,2,-1,5,10,12,0,0,4]) => 13`

   To receive full marks, you need to write a little explanation of which part of your code does what.

5. (20 points) Write down a Python function `gcd(x,y)` that returns the greatest common divisor of two positive integers `x` and `y`. Use Euclid's algorithm. [Hint: Start with the basic idea that `gcd(x,y) = gcd(y,r)` where $x = qy + r$.] You may assume that $x > y$.

   To receive full marks, you need to write a little explanation of which part of your code does what.