You will find a private GitHub repo called `<github-username>-hw` where you will submit all your homework assignments. Clone this repo and create a `hw3` directory inside. Add this directory to the repo using `$ git add hw3`. All your code should appear in a file called `hw3.py` that lives inside the `hw3` directory. Make sure to add `hw3.py` to the repo and commit your changes with `$ git commit -a -m "good log message"`.

Question 1 (5 points). *Consider the following observations about binary representations of integers.*

- *If x is an even integer then its binary representation ends with a 0; if x is an odd integer then its binary representation ends with a 1.*

- *If x is an integer whose binary representation uses k bits $b_k b_{k-1} \cdots b_1$ then $x//2$ is an integer whose binary representation is exactly $b_k b_{k-1} \cdots b_2$. That is, integer division by 2 is the same as shifting the binary number to the right by one place.*

Use the above two observations to write a function called `to_binary(x)` *that converts an integer into a binary. You must use these observations in your code.*

```
>>> to_binary(0)
'0'
>>> to_binary(1)
'1'
>>> to_binary(10)
'1010'
>>> to_binary(64)
'1000000'
>>> to_binary(55)
'110111'
>>>
```

Question 2 (5 points). *Write a function called* `to_decimal(b)` *that converts a binary string representing a non-negative integer into its decimal value. Your function definition should be 1 line long, use* `itertools.count`, `zip`, `sum`, *and a list comprehension.*

```
>>> >>> to_decimal('110111')
55
>>> to_decimal(to_binary(101))
101
>>> to_decimal('00')
0
>>> to_decimal('01')
1
```

Question 3. *Pick any Project Euler problem (`https://projecteuler.net/archives`) that we haven't considered in class and write a solution to solve it. Include your problem number, code, and solution.*

Question 4 (extra credit). *Pick any Project Euler problem (`https://projecteuler.net/archives`) ranging from 51-100 that we haven't considered in class and write a solution to solve it. Include your problem number, code, and solution.*