CS240 HW #6

Answers to the following exercises should be prepared in a text editor and submitted through blackboard as a .pdf file. Equations should be properly formatted using equation editing software. Don't forget to include your name and an honor code statement.

1. Write the value of the following recurrences for $n = 0$ to 4. (6pts)

   - $T(0) = 4$
     $T(n) = 5T(n-1)$

   - $T(0) = 2$
     $T(1) = 2$
     $T(n) = 2 + 2T(n-2)$

   - $T(0) = 0$
     $T(n) = 2n^2 + T(n-1)$

2. Write the value of the following recurrences for $n = 1$, 2, 4 and 8. (6pts)

   - $T(1) = 2$
     $T(n) = 5T(n/2)$

   - $T(1) = 4$
     $T(n) = 2 + 2T(n/2)$

   - $T(1) = 0$
     $T(n) = 2n^2 + T(n/2)$

3. Write recurrence relations that describe the number of times that `basicOp` is called by each of the following recursive functions. (10pts)

```
def fun1(n):
    if n == 0:
        return 0
    else:
        sum = 0
        for i in range(n):
            sum += basicOperation()
        return fun1(n - 1) + sum

def fun2(n):
    if n == 0:
        return basicOperation()
    else:
        basicOperation()
        basicOperation()
        return fun2(n - 1) + fun2(n - 1)
```

4. Use the method of backward substitution to solve the recurrences from the previous exercise. Show your work. (10pts)

   For the second recurrence, it will be useful to know that:
   $\sum_{j=0}^{n} 2^j = 2^{n+1} - 1.$