The start of recession is the first quarter of at least 2 quarters of GDP decline

Let me clear this through an example

	Quarter:	GDP:	GDP change:	change
1	1999q3	9	--	------
2	1999q4	10	1	increase
3	2000q1	9	-1	decline
4	2000q2	8	-1	decline
5	2000q3	7	-1	decline
6	2000q4	6	-1	decline
7	2001q1	8	1	increase
8	2001q2	11	3	increase
9	2001q3	12	1	increase

Note that GDP used is the chained 2009,

The start of recession in the example above is '**2000q1**'because the GDP decline started then

recession end is '**2001q2**'

recession bottom is '**2000q4**' because it has the minimum GDP between start and end

You can compute the difference between a value and its predecessor in a series using df['diff'] = df['gdp'].diff()

use df['diff'] to create gdp_b which is a series with value 0 if GDP difference is less than 0 i.e declines and 1 if GDP difference is greater that 0 i.e increased. does this look familiar? Assignment 3 answer_ten()

```
1   QTR
2   2000q1    0
3   2000q2    1
4   2000q3    1
5   2000q4    1
6   2001q1    0
7   2001q2    1
8   .......
9   2015q1    1
10  2015q2    1
11  2015q3    1
12  2015q4    1
13  2016q1    1
14  2016q2    1
15  Name: gdp_b, dtype: int64
```

In order to find recession you will be looking for a **sequence** with 2 or more declines followed by 2 increases in GDP, i.e 0..0011.

This sequence can be found in many different ways, here are two

1.use a variable to store previous quarter gdp change (prev), and a list to keep track of the possible matching patterns (seq) while looping through gdp_b, the list will be appended and emptied depending on its length of and the current and the previous gdp change. The loop is exited when the second 1 in the **sequence** is found

2. convert the values of the series to a string i.e. ''.join(gdp_b.values) and use **str.index()** to find the index (**ind)** of the pattern "0011" then use **str.rindex()** to find the last occurrence of 1 before the pattern "0011" occurred, adding one to that will give you the position of the start recession. The recession end index will be ind-len(pattern)-1