```python
listA = [5, 1, 3, 8, 4]


def gen_list(l):
    if not l:                   # check if the input list is None or empty
        return []
    if len(l) == 1:         # check if the input lsit contains only 1 element
        return list(l)


    result = []                          # the resulting list
    # Find the average for the first element
    result.append((l[0] + l[1]) / 2.)


    # Find the average value for all list elements
    # located between the first and the last element
    for k in xrange(1, len(l) - 1):
        result.append(sum(l[k - 1:k + 2]) / 3.)


    # Find the average value for the last list element
    result.append((l[-1] + l[-2]) / 2.)
    return result

print listA
print gen_list(listA)
```