```python
"""DFT """
import math

def iexp(n):
    return complex(math.cos(n), math.sin(n))

def is_pow2(n):
    return False if n == 0 else (n == 1 or is_pow2(n >> 1))

def dft(xs):
    "naive dft"
    n = len(xs)
    return [sum((xs[k] * iexp(-2 * math.pi * i * k / n) for k in range(n)))
            for i in range(n)]

def dftinv(xs):
    "naive dft"
    n = len(xs)
    return [sum((xs[k] * iexp(2 * math.pi * i * k / n) for k in range(n))) / n
            for i in range(n)]

if __name__ == "__main__":
    wave1 = [1,0,0,0,0,0,0,0]
    wave2 = [1,1,1,1,1,1,1,1]
    wave3 = [1,-1,1,-1,1,-1,1,-1]
    wave4 = [3,0,2,0,2,0,2,0]
    dfreq5 = [1,1,0,0,0,0,1,1]
    dfreq6 = [1,1,0,0,0,0,0,1]
    dfreq1 = dft(wave1)
    dfreq2 = dft(wave2)
    dfreq3 = dft(wave3)

    dfreq4 = dft(wave4)
    wave5 = dftinv(dfreq5)
    wave6 = dftinv(dfreq6)

    print('a')
    print(dfreq1)
    print('b')
    print(dfreq2)
    print('c')
    print(dfreq3)
    print('d')
    print(dfreq4)
    print('e')
    print(wave5)
    print('f')
    print(wave6)
    pass
```

```
a
[(1+0j), (1+0j), (1+0j), (1+0j), (1+0j), (1+0j), (1+0j), (1+0j)]
b
[(8+0j), (-5.551115123125783e-16+2.220446049250313e-16j), (-4.286263797015736e-16-4.440892098500626e-16j), (-2.220446049250313e-16+8.881784197001252e-16j), -4.898587196589413e-16j, (-2.1094237467877974e-15-1.2212453270876722e-15j), (-2.9329683544708742e-15-6.661338147750939e-16j), (3.552713678800501e-15+1.1102230246251565e-15j)]
c
[0j, (1.1102230246251565e-16-1.1102230246251565e-16j), (9.555947231402665e-17-1.1102230246251565e-16j), (8.881784197001252e-16-1.5543122344752192e-15j), (8+3.4290110376125885e-15j), (-2.6645352591003757e-15+1.1102230246251565e-16j), (2.9329683544708742e-15-6.661338147750939e-16j), (-5.218048215738236e-15-2.6645352591003757e-15j)]

d
[(9+0j), (0.9999999999999997-4.440892098500626e-16j), (1-4.898587196589412e-16j), (1.0000000000000007-6.661338147750939e-16j), (9+2.9391523179536475e-15j), (0.999999999999995-1.3322676295501878e-15j), (1-1.469576158976824e-15j), (0.9999999999999981-1.7763568394002505e-15j)]
[(0.5+0j), (0.3017766952966368-0.125j), (-5.35782974626967e-17+5.551115123125783e-17j), (-0.05177669529663678+0.12499999999999997j), 3.0616169978683836e-17j, (-0.05177669529663707-0.12499999999999982j), (-8.906528815257012e-17+1.3877787807814457e-16j), (0.3017766952966372+0.12499999999999961j)]
[(0.375+0j), (0.3017766952966368-1.3877787807814457e-17j), (0.12499999999999994+0j), (-0.05177669529663685-1.3877787807814457e-17j), (-0.125+1.2246467991473532e-16j), (-0.05177669529663673+1.8041124150158794e-16j), (0.12499999999999992+0j), (0.3017766952966372-3.885780586188048e-16j)]
```