

Program V.1 In the style of the plots in the Lecture 6, plot the GFs for the set of bitstrings having no occurrence of the pattern 0000000001. Do the same for 0101010101. (See Web Exercise V.1 and Program IV.2).

The OGF of the number of strings that do not contain the pattern 0000000001 is

$$B(z) = \frac{1}{z^{10} + 1 - 2z}$$

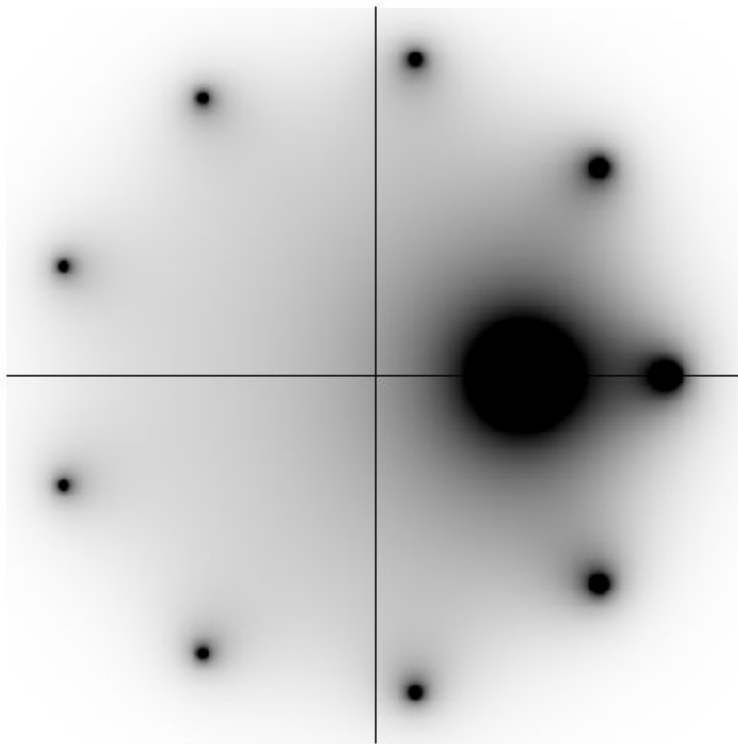
And the OGF of the number of bitstring that do not contain the pattern 0101010101 i

$$B(z) = \frac{1+z^2+z^4+z^6+z^8}{z^{10}+(1-2z)(1+z^2+z^4+z^6+z^8)}$$

I plugged these GFs into the following code and got the following plots:

```
public class BitstringWithout0000000001 implements ComplexFunction
{
    public Complex eval(Complex z)
    {
        Complex one = new Complex(1, 0);
        Complex two = new Complex(2, 0);
        Complex a =
z.times(z.times(z.times(z.times(z.times(z.times(z.times(z.times(z.times(z))))))))); // first term z^10
        Complex b = two.times(z); // third term 2z
        Complex c = a.plus(one.minus(b)); // denominator z^10 + 1 - 2z
        return c.reciprocal(); // return the GF
    }

    public static void main(String[] args)
    {
        Plot2Dez.show(new BitstringWithout0000000001(), 512); // plot it on a 2.5
by 2.5 square
    }
}
```



```
public class BitstringWithout0101010101 implements ComplexFunction
{
    public Complex eval(Complex z)
    {
        // constant variables
        Complex one = new Complex(1, 0);
        Complex two = new Complex(2, 0);
        // powers
        Complex squared = z.times(z); // z^2
        Complex fourth = squared.times(squared); // z^4
        Complex sixth = fourth.times(squared); // z^6
        Complex eighth = fourth.times(fourth); // z^8
        Complex tenth = sixth.times(fourth); // z^10
    }
}
```

```

// 1 + z^2 + z^4 + z^6 + z^8 + z^10
Complex numerator =
one.plus(squared.plus(fourth.plus(sixth.plus(eighth.plus(tenth)))));
// other terms
Complex b = one.minus(two.times(z)); // part of denominator
Complex denominator = tenth.plus(b.times(numerator)); // entire denominator
return numerator.divides(denominator);
}
public static void main(String[] args)
{
    Plot2Dez.show(new BitstringWithout0101010101(), 512); // plot it on a 2.5
by 2.5 square
}
}

```

