DSP Lab **Exercise 5**

Major Code Changes

1. **Set denominator coefficients for poles at radius r and angle ω1**

```
r = 0.95
f1 = 440.0
omega1 = 2 * pi * f1 / Fs
a1 = -2 * r * cos(omega1)
a2 = r**2
```

2. **Defined numerator coefficients for the target impulse response**

   Target:
   $h(n) = r^n \cos(\omega_1 n) u(n).$

```
b0 = 1.0
b1 = -r * cos(omega1)
b2 = 0.0
```

3. **Used the difference equation**

```
y0 = b0*x0 + b1*x1 + b2*x2 - a1*y1 - a2*y2
```

How should gain be set to ensure the impulse response does not exceed the maximum allowed value of **2^15 - 1**?

To make sure gain ≤ 2^15 - 1 = 32767.