Exercise 3 [20%] 11011 $\overline{)1100\ 10\ 10\ 1110\ 1000000}$
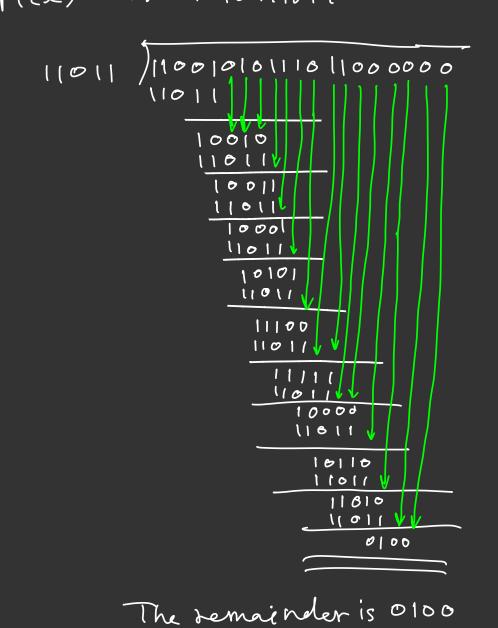
- Given G(x) = x^4 + x^3 + x + 1 generator polynomial
- Calculate the 4-bit CRC for the input 1100 1010 1110 1100
- The message above will degrade during the transmission.
- The receiver's data link layer will receive 1100 1010 1101 1010 0100.
- Is the error detectable by the generator polynomial? If not, why?

$$G(x) = x^4 + x^3 + x + 1 \qquad L = 5$$
$$4\text{-bit CRC is used} \qquad L-1 = 4$$

$$G(x) = 11011$$
$$M(x) = 1100\,1010\,1110\,1100\,0000$$


```
11011 )1100 1010 1110 1100 0000
       11011
       ─────
        10010
        11011
        ─────
         10011
         11011
         ─────
          10001
          11011
          ─────
           10101
           11011
           ─────
            11100
            11011
            ─────
             11111
             11011
             ─────
              10000
              11011
              ─────
               10110
               11011
               ─────
                11010
                11011
                ─────
                 0100
```

The remainder is 0100

Check if the received data's error
is detectable by G(x)

$$
11011 \ \overline{) \ 1100\ 1010\ 1101\ 1010\ 0100\ 0000}
$$

```
           1100 1010 1101 1010 0100 0000
11011 )   
           11011
          _____
            10010
            11011
           _____
             10011
             11011
            _____
              10001
              11011
             _____
               10100
               11011
              _____
                11111
                11011
               _____
                 10010
                 11011
                _____
                  10011
                  11011
                 _____
                   10000
                   11011
                  _____
                    10110
                    11011
                   _____
                     11011
                     11011
                    _____
                      0000
```

#ANS# The error is detectable by
The polynomial.