$x^8 \pmod{m(x)} = [m(x) - x^8] \pmod 2$
$= m(x) \text{ xor } x^8$

$= (x^8 + x^4 + x^3 + x + 1) \text{ xor } x^8$
$= x^4 + x^3 + x + 1$
$= (0001\ 1011)$

$x^8 \bmod (x^8 + x^4 + x^3 + x + 1) = ?$

```
                                   1 <- Quotient
                                 ----------------------------------
x^8 + x^4 + x^3 + x + 1 |  x^8
                                   x^8 + x^4 + x^3 + x + 1
                                   --------------------------------
                                           x^4  + x^3 + x + 1
```

$x-y \pmod 2 = x \text{ xor } y$

$g(x) + h(x)\ [\bmod m(x)] = g(x)\ [\bmod m(x)] \text{ xor } h(x)\ [\bmod m(x)]$
$g(x) = 1.x^8 = x^8$
$h(x) = (b6\ b5....b1\ b0\ 0)$
$h(x) \bmod [m(x)] = h(x) = (b6\ b5....b1\ b0\ 0)$
$g(x) \bmod m(x) = x^8 \bmod (m(x)) = (0001\ 1011)$

$g(x) + h(x)\ [\bmod m(x)] = (b6\ b5....b1\ b0\ 0) \text{ xor } (0001\ 1011)$

Product of two polynomials $f(x)$ and $g(x)$ in $GF(2^8)$:

Let $f(x) = b_7x^7 + b_6 x^6 + ... + b_1x + b_0$

$f(x) . g(x) \bmod m(x)$
$= b_7 [x^7 \times g(x)] \text{ xor } b_6 [x^6 \times g(x)] \text{ xor } ..... \text{ xor } b_1 [x \times g(x)] \text{ xor } b_0\, g(x)$

$$H = \begin{matrix} 1 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 & 1 \end{matrix}$$

$x = \langle 1\ 0\ 0\ 1 \rangle = \langle x3\ x5\ x6\ x7 \rangle$

$y = \langle y1\ y2\ y3\ y4\ y5\ y6\ y7 \rangle$

$(y3\ \ y5\ y6\ y7\ ) = (x3\ \ x5\ x6\ x7)$
error detecting code = $(y1\ y2\ y4)$