

$$20a) (1, 2, 0, 1) \rightarrow P(x) = 1 + 2x + 0x^2 + 1x^3 = 1 + 2x + x^3$$

evaluate at  $1, 2, \dots, 6 \stackrel{?}{=} a_i$

$$P(1) = 1 + 2 \cdot 1 + 1^3 = 4 \quad (\text{mod } 11)$$

$$P(2) = 1 + 2 \cdot 2 + 2^3 = 13 = 2$$

$$P(3) = 1$$

$$P(4) = 7$$

$$P(5) = 4$$

$$P(6) = 9$$

$$\text{Encoded message} = (4, 2, 1, 7, 4, 9)$$

b) received  $\hat{=}$   $P(u_i)$  :  $(4, 2, 1) \in (4, 9)$  use these for decoding  
set up  $g_i(x)$  :  $g_i(x) = (x-1)(x-2)(x-3)(x-5)$   
1 factor will always be discarded

$$g_1(x) = (x-2)(x-3)(x-5)$$

$$g_2(x) = (x-1)(x-3)(x-5)$$

$$g_3(x) = (x-1)(x-2)(x-5)$$

$$g_5(x) = (x-1)(x-2)(x-3)$$

plug-in the used evaluation positions : 1, 2, 3, 5

$$g_1(1) = (1-2)(1-3)(1-5) = 3$$

$$g_2(2) = 3$$

$$g_3(3) = 7$$

$$g_5(5) = 2$$

mod 11!