1) $x^4 - 5x^3 + 3x^2 + x = (x^2 + 1)(x^2 - 5x + 2) + (6x - 2)$.

2) Since x^2+x+1 is quadratic, either it is irreducible, or it can be factored into linear factors. The only linear polynomials in $\mathbb{Z}_2(X)$ are x and $x+1$. However, $x^2+x+1 = x(x+1)+1$. Therefore, neither x nor $x+1$ divide x^2+x+1. Ergo, x^2+x+1 is irreducible.

3) If we try to use the Euclidean algorithm, we will fail. In the second division, we would have to invert 29, which we cannot do in the integers. Therefore, we need a different technique for finding the greatest common divisor. We see that $b(-1) = 0$, and hence $x + 1$ is a factor of $b(x)$. Therefore, we can factor $b(x)$ as follows:

$$b(x) = (x + 1)(x^4 + 2x^2 + 1) = (x + 1)(x^2 + 1)^2$$

$x + 1$ and $x^2 + 1$ are both irreducible in $\mathbb{Z}[X]$. $x + 1$ does not divide $a(x)$, but $x^2 + 1$ does, precisely once.

$$a(x) = (x^2 + 1)(x^2 - 5x + 2)$$

Therefore, the gcd of $a(x)$ and $b(x)$ is $x^2 + 1$.

4) The key to this problem is to note that $\omega^{16} = -1$, and therefore $x + \omega^n = x - \omega^{16+n}$.

The proper ordering of factors is (leftmost column):

$x-\omega$	$x^2-\omega^2$	$x^4-\omega^4$	$x^8-\omega^8$	$x^{16}-\omega^{16}$	$x^{32}-\omega^0$
$x-\omega^{17}$					
$x-\omega^{9}$	$x^2-\omega^{18}$				
$x-\omega^{25}$					
$x-\omega^{5}$	$x^2-\omega^{10}$	$x^4-\omega^{20}$			
$x-\omega^{21}$					
$x-\omega^{13}$	$x^2-\omega^{26}$				
$x-\omega^{29}$					
$x-\omega^{3}$	$x^2-\omega^{6}$	$x^4-\omega^{12}$	$x^8-\omega^{24}$		
$x-\omega^{19}$					
$x-\omega^{11}$	$x^2-\omega^{22}$				
$x-\omega^{27}$					
$x-\omega^{7}$	$x^2-\omega^{14}$	$x^4-\omega^{28}$			
$x-\omega^{23}$					
$x-\omega^{15}$	$x^2-\omega^{30}$				
$x-\omega^{31}$					
$x-\omega^{2}$	$x^2-\omega^{4}$	$x^4-\omega^{8}$	$x^8-\omega^{16}$	$x^{16}-\omega^0$	
$x-\omega^{18}$					
$x-\omega^{10}$	$x^2-\omega^{20}$				
$x-\omega^{26}$					
$x-\omega^{6}$	$x^2-\omega^{12}$	$x^4-\omega^{24}$			
$x-\omega^{22}$					
$x-\omega^{14}$	$x^2-\omega^{28}$				
$x-\omega^{30}$					
$x-\omega^{4}$	$x^2-\omega^{8}$	$x^4-\omega^{16}$	$x^8-\omega^{0}$		
$x-\omega^{20}$					
$x-\omega^{12}$	$x^2-\omega^{24}$				
$x-\omega^{28}$					
$x-\omega^{8}$	$x^2-\omega^{16}$	$x^4-\omega^{0}$			
$x-\omega^{24}$					
$x-\omega^{16}$	$x^2-\omega^{0}$				
$x-\omega^{0}$					