Introduction - How to Prove It : Answers to exercises

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1.(a.) Factor $2^15 - 1 = 32,767$ into two smaller positive integers
7, 4681
(b.) Find an integer x such that $1 < x < 2^{32767} - 1$ and $2^{32767} - 1$ is divisible by x.
127 i.e. $2^7 - 1$.

2.

n	Is n prime?	$3^n - 1$	Is $3^n - 1$ prime?
2	Y	8	N
3	Y	26	N
4	N	80	N
5	Y	242	N
6	N	728	N
7	Y	2186	N
8	N	6560	N
9	N	19682	N
10	N	59048	N

Based on the values of the table I conjecture that $3^n - 1$ is always even, and so is never prime.

3. Euclid's theorem
(a.) Find a prime different from 2,3,5 and 7.
$Letm = 2 * 3 * 5 * 7 + 1 = 211$
211 is prime (b.) Find a prime different from 2,5 and 11.
Let m $= 2 * 5 * 11 + 1 = 111$
111 has the factor 3, which is different to the primes above.

4. Find five consecutive integers that are not prime.
Let $n = 5$ and let $x = (n + 1)! + 2 = 722$
722,723,724,725 and 726 are not prime.
727 is prime.