Factor Theorem

A polynomial $f(x)$ has a factor $x - k$ if and only if $f(k) = 0$.

	Example	Your Turn
Given Function with $f(k) = 0$.	$f(x) = x^3 + 3x^2 - 4x - 12$ given $f(2) = 0$	$f(x) = 2x^3 + 11x^2 + 18x + 9$ given $f(-3) = 0$
Use synthetic division to find the other factors.	$2 \mid 1 \;\; 3 \;\; -4 \;\; -12$ $\downarrow \;\; 2 \;\; 10 \;\; 12$ $1 \;\; 5 \;\; 6 \;\; 0$	$-3 \mid 2 \;\; 11 \;\; 18 \;\; 9$ $\downarrow \;\; -6 \;\; -15 \;\; -9$ $2 \;\; 5 \;\; 3 \;\; 0$
Interpret the 3rd row as a quadratic expression.	$x^2 + 5x + 6 = 0$	$2x^2 + 5x + 3 = 0$
Factor the resulting polynomial.	$(x+3)(x+2) = 0$ $x = -3, \; x = -2$	$x^2 + 5x + 6 = 0$ $(x+2)(x+3)$ $(x+1)\left(x+\frac{3}{2}\right) = 0$ $x = -1, \; x = -\frac{3}{2}$
Write your polynomial in factored form. Remember the one factor that was given $(x - k)$.	Answers: $x = -3, \; x = -2$ $x = 2$	Answers: $x = -1, \; x = -\frac{3}{2}, \; x = 3$

What would the 3rd row represent if f(x) was degree n?