Problem 3.12

(a) Table of frequencies of the tones of the octave beginning with middle C, assuming that the A is above middle C is tuned to 440 Hz:

Note Name	C_4	$C_4^{\#}$	D_4	E_4^b	E_4	F_4	$F_4^{\#}$
Note Number	40	41	42	43	44	45	46
Frequency	262	277	294	311	330	349	370
Note Name	$F_4^{\#}$	G_4	$G_4^{\#}$	A_4	B_4^b	B_4	C_4
Note Number	46	47	48	49	50	51	52
Frequency	370	392	415	440	466	494	523

(b) Formula for frequency f as a function of the note number n:

$f(n) = 440[2^{(\frac{(n-49)}{12}}]$

(c) The spectrum has the form (frequency, amplitude) as:

$[(-440, A_3), (-370, A_2), (-294, A_1), (294, A_1), (370, A_2), (440, A_3)]$

The coefficients must have similar magnitudes, phases may be different to sound like a musical chord.

Spectrum plot :