Brass Instrument Frequencies

Different musical instruments have different pitches. The pitch of a small trumpet is higher than that of a large tuba. The pitch of a musical note is determined by the frequency of the wave producing that note. Frequencies are measured in Hertz (Hz), and this is the number of soundwaves per second.

Brass instruments come in a variety of lengths. A bass tuba would be around 4 metres long if it was uncoiled. The larger the length of a brass instrument, the lower the pitch.

1) Based on the information above, what type of model would be the most appropriate for modelling the relationship between the length of a brass instrument and the frequency of its pitch?
   - Linear
   - Quadratic
   - Exponential Growth
   - Exponential Decay

   Justify your answer.

2) Draw a sketch of the graph for pitch frequency on instrument length.

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The table below gives data about different brass instruments.

Instrument	Length (m)	Pitch (note)	Frequency (Hz)
Piccolo Trumpet	0.69	$B\flat_4$	466.16
Soprano Cornet	0.953	$E\flat_4$	311.13
Cornet	1.4	$B\flat_3$	233.08
Alto Horn	2.06	$E\flat_3$	155.56
Tenor Trombone	2.7	$B\flat_2$	116.54
French Horn	3.7	F_2	87.31
Bass tuba	4.1	$E\flat_2$	77.78
Contrabass tuba	5.5	$B\flat_1$	58.27

3) Produce a graph displaying Frequency vs. Length. Remember to include suitable labels and a title.

4) Fit an appropriate model to the data.

5) An Alphorn is 3.47 metres in length. Use your model to predict its frequency.