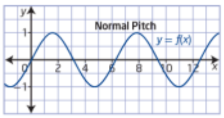
p 031, qC4

C4 Sound is a form of energy produced and transmitted by vibrating matter that travels in waves. Pitch is the measure of how high or how low a sound is. The graph of $f(x)$ demonstrates a normal pitch. Copy the graph, then sketch the graphs of $y = f(3x)$, indicating a higher pitch, and $y = f\left(\frac{1}{2}x\right)$, for a lower pitch.



$g(x) = f(3x)$ the higher pitch $\Rightarrow$ the mapping is $(x, y) \to \left(\frac{1}{3}x, y\right)$

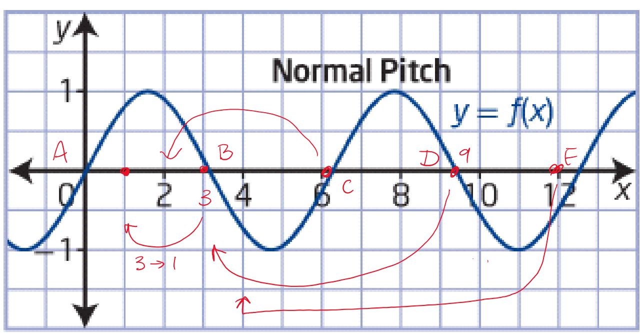
So every x: $x \to \frac{1}{3}x$

and y stays the same

$0 \to \frac{1}{3}0 = 0$ $\quad$ $6 \to \frac{1}{3} \cdot 6 = 2$

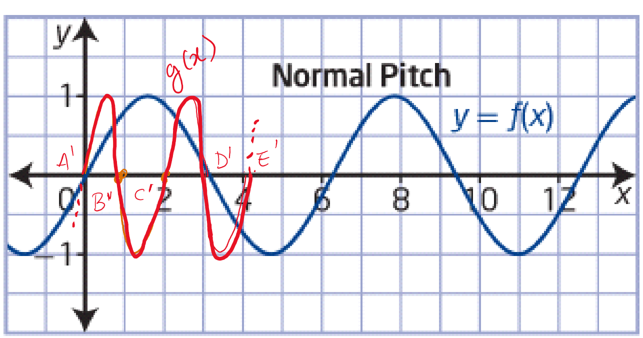
$3 \to \frac{1}{3}3 = 1$ $\quad$ $12 \to \frac{1}{3} \cdot 12 = 4$

The following shows how points on the x-axis move w/ the transformation:



the y-s remain unchanged, we are just compressing the wave w/ denser x-values..

Next is the actual transformation:



the new pitch $g(x)$ in red.

$g(x) = f\left(\frac{1}{2}x\right)$, the lower pitch. $\to$ a horizontal only stretch

How do the points move? We must look @ the mapping: $(x, y) \to \left(\frac{1}{\frac{1}{2}}x, y\right) = (2x, y)$

Calculate a few points, ~~for~~ ex. the roots:

$0 \to 2 \cdot 0 = 0$

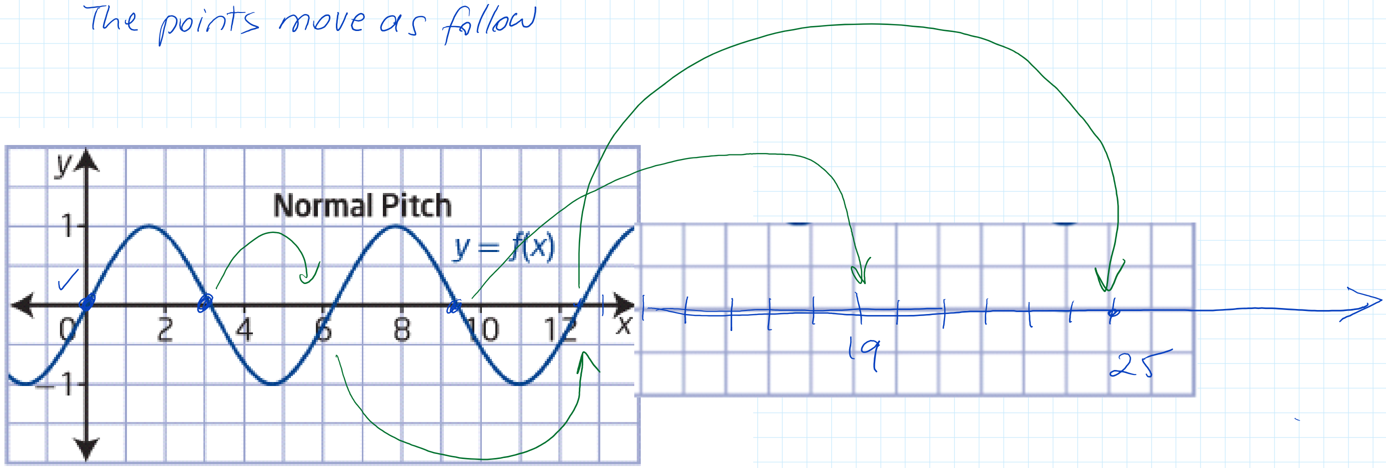
$3 \to 2 \cdot 3 = 6$

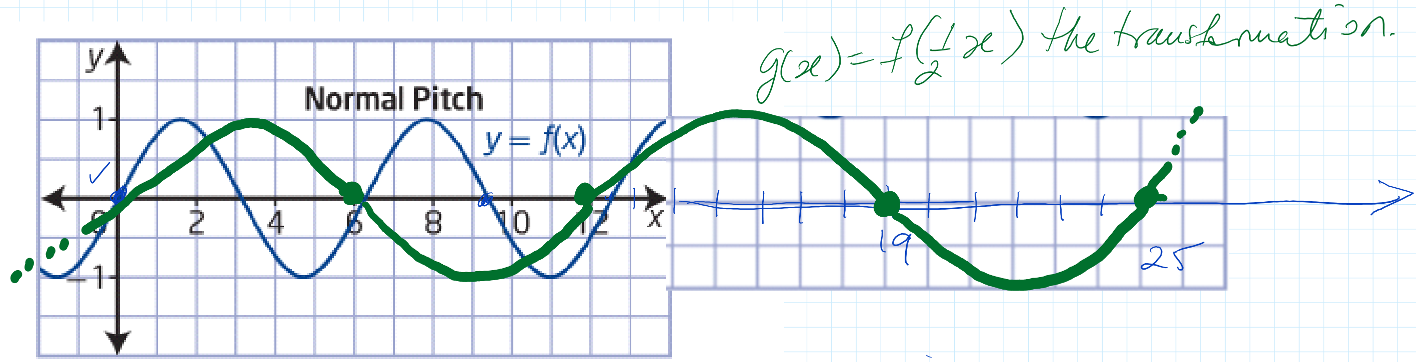
$\simeq 6 \to 2 \times 6 = 12$

$9.5 \to 2 \times 9.5 = 19$

$12.5 \to 2 \times 12.5 = 25$

The points move as follow





The two transformations on one graph: