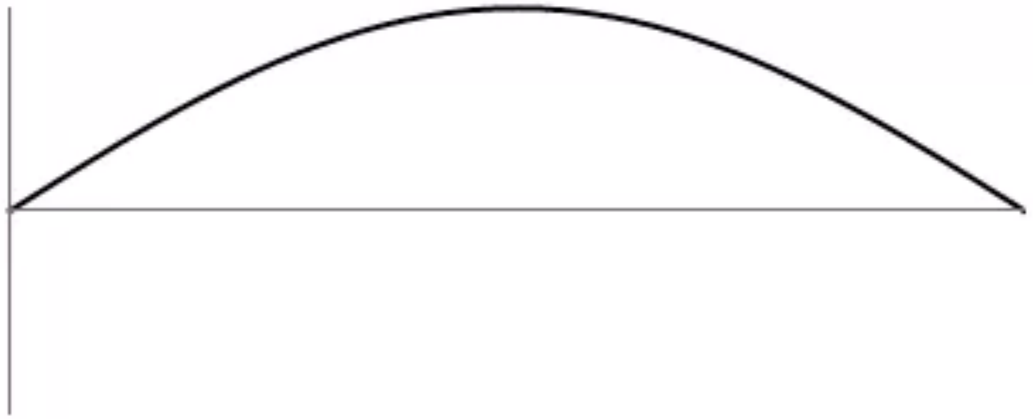
A journey of (in-)commensuration

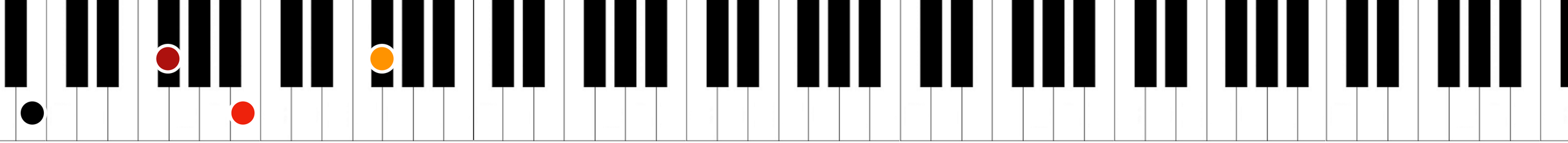
from
pythagorean harmony
to
modern quantum physics

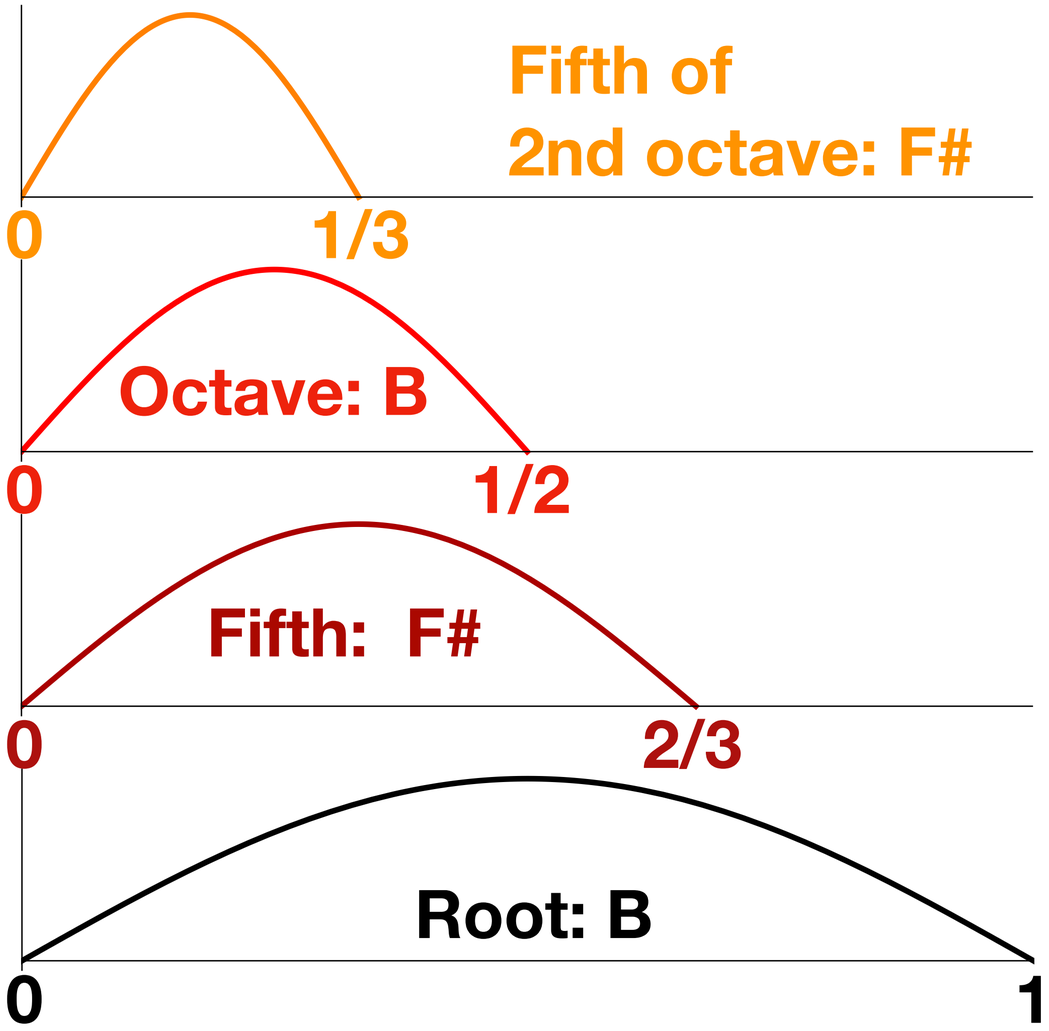
Elio König-Tarasevich

J.P.G. Lejeune Dirichlet (1805-1859)

R. Mendelssohn Bartholdy (1811-1858)



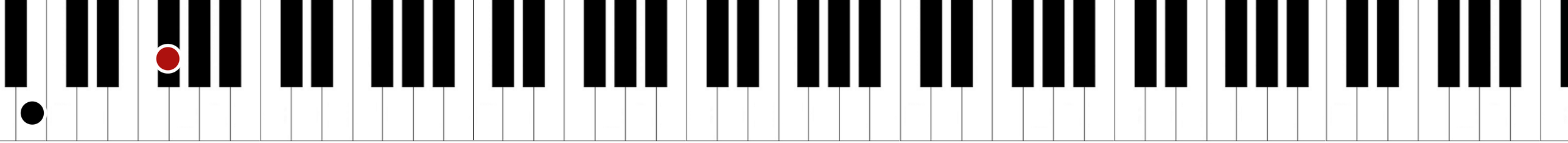




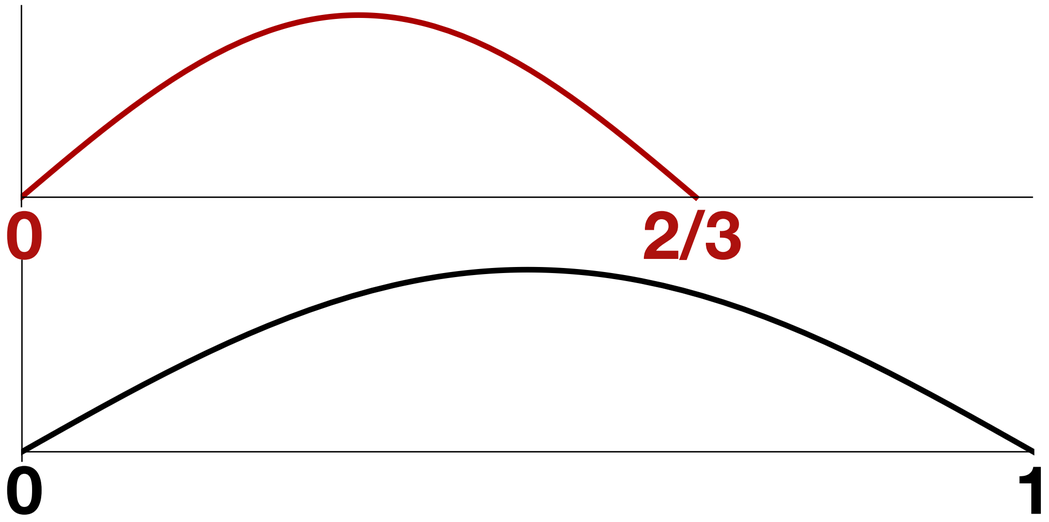
2nd overtone

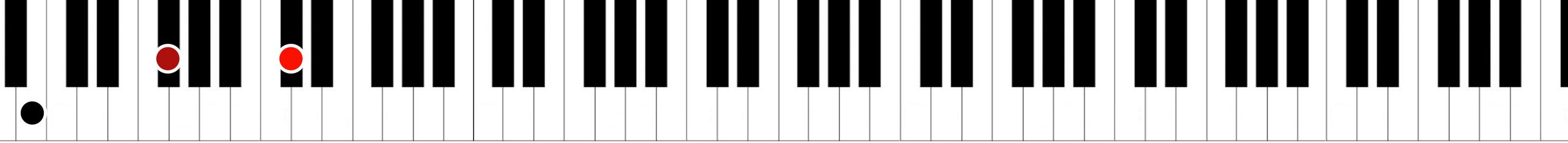
1st overtone

Fundamental tone



Tuning following the cycle of fifths





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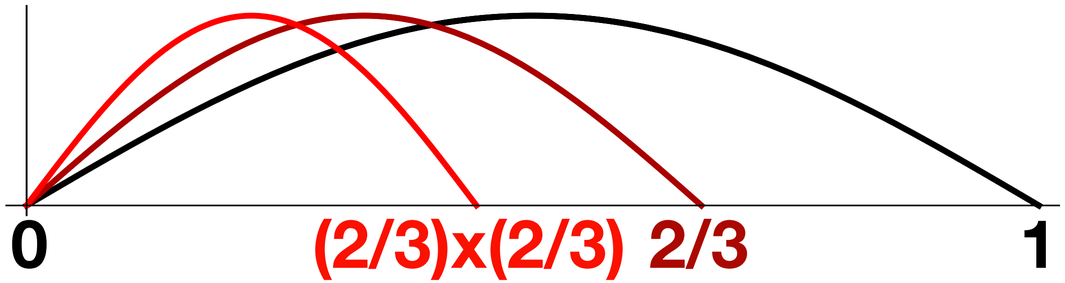

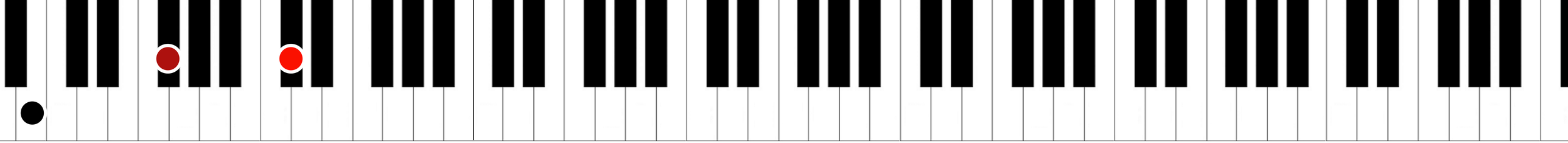

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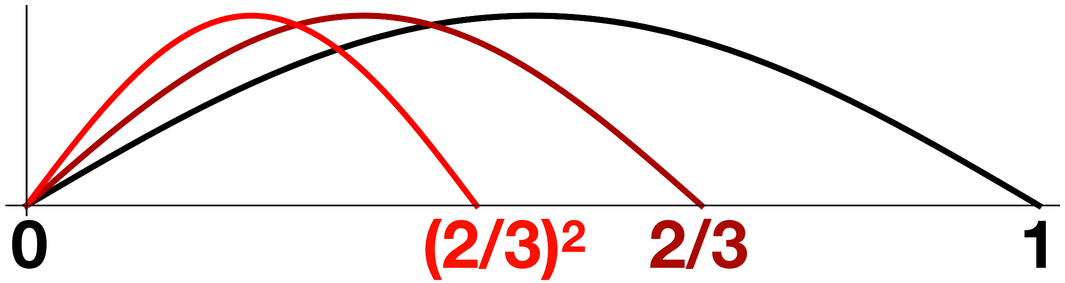

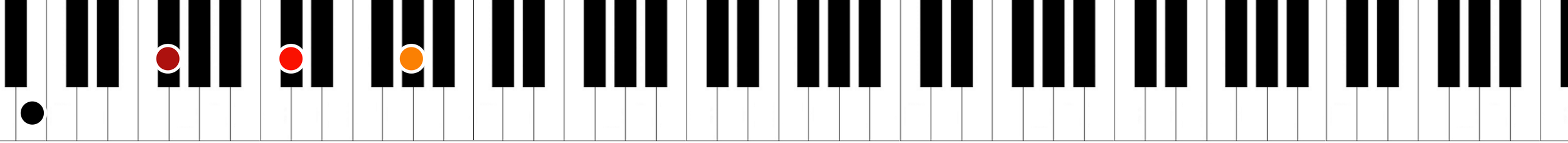

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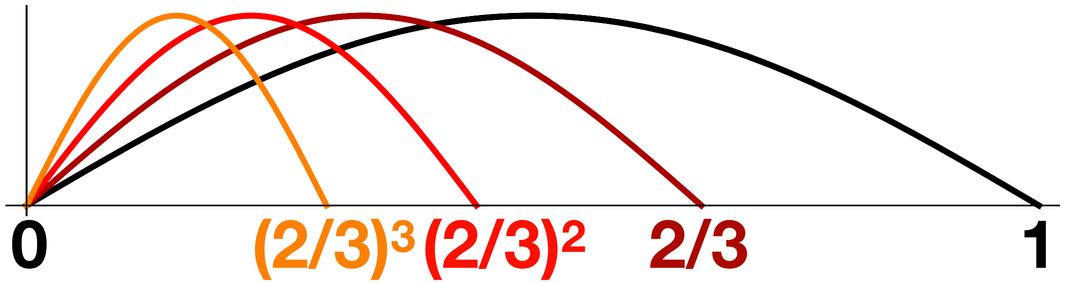

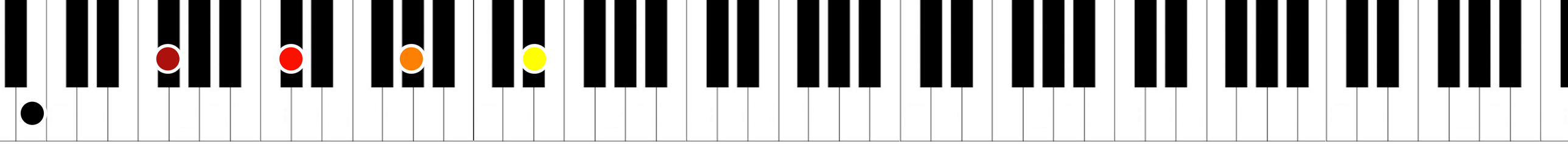

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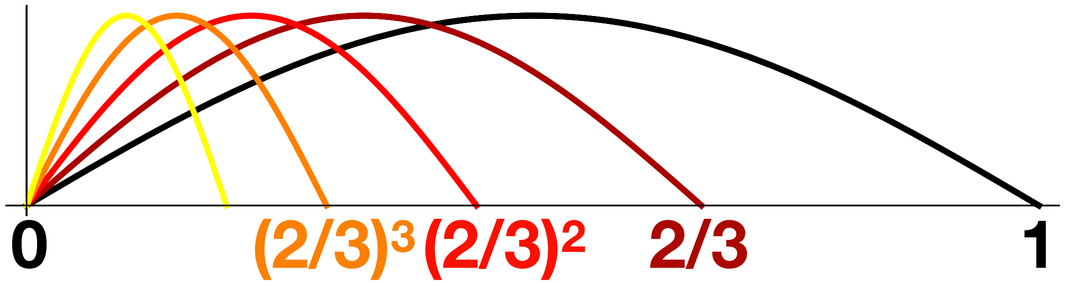

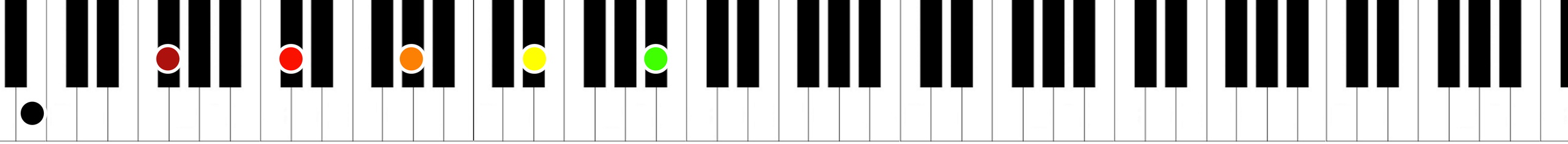

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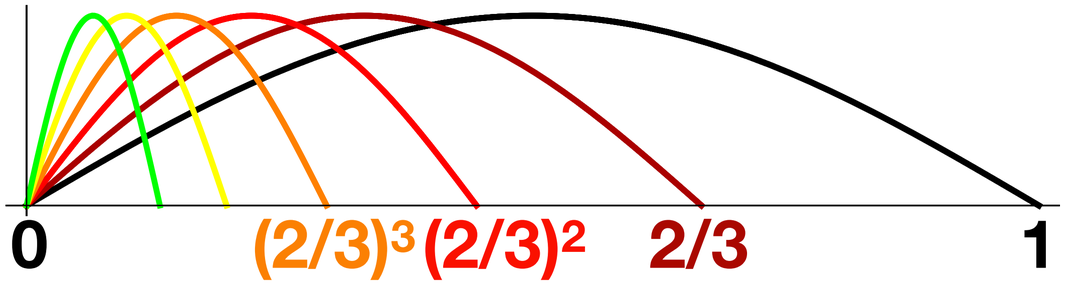

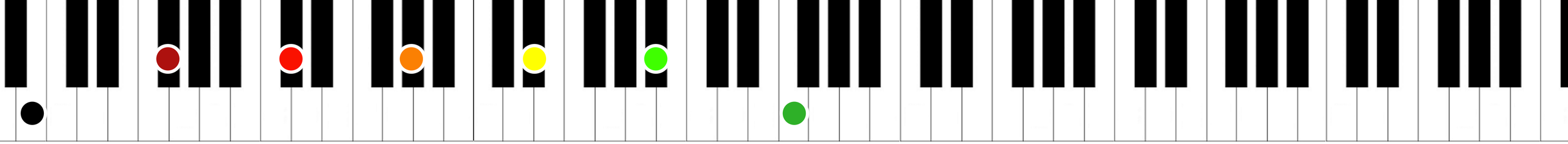

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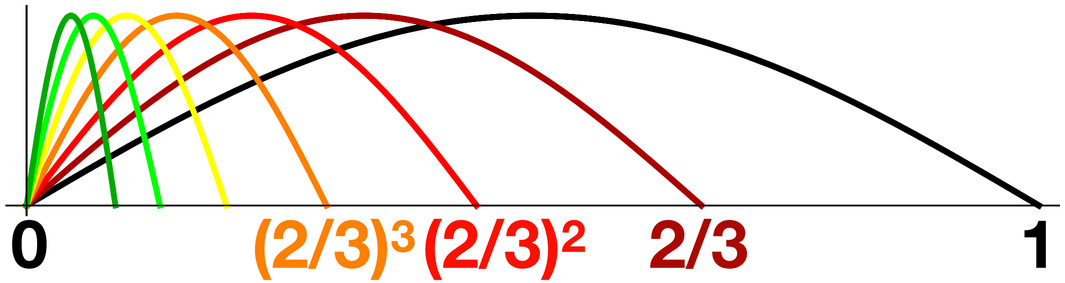

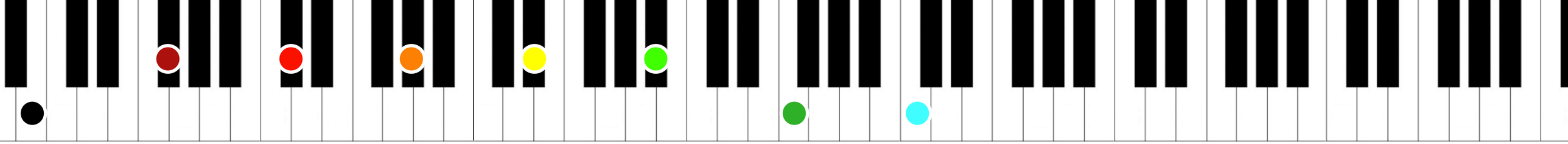

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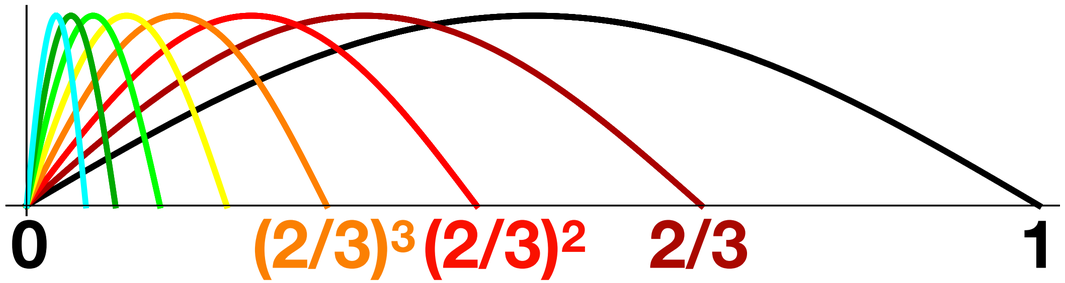

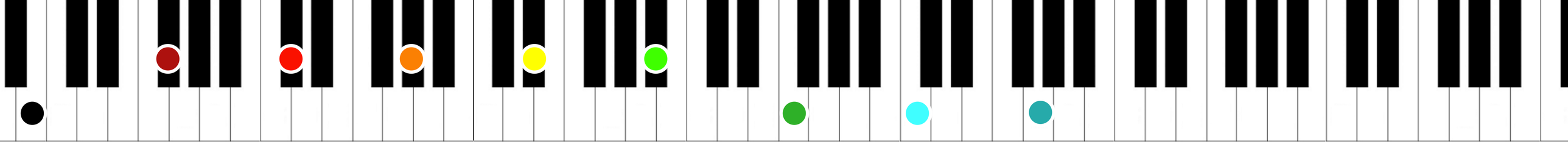

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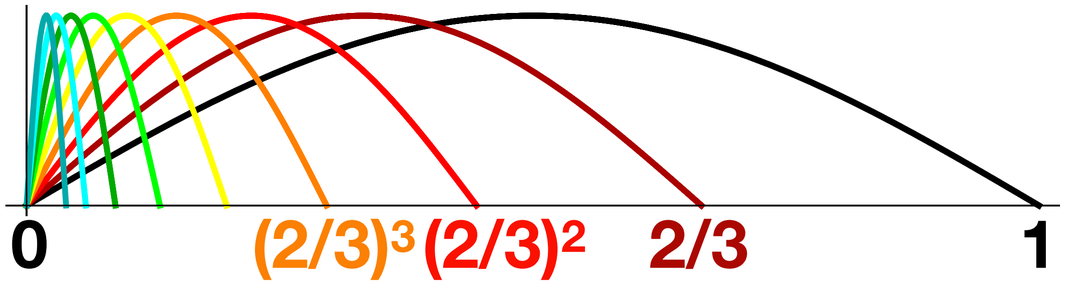

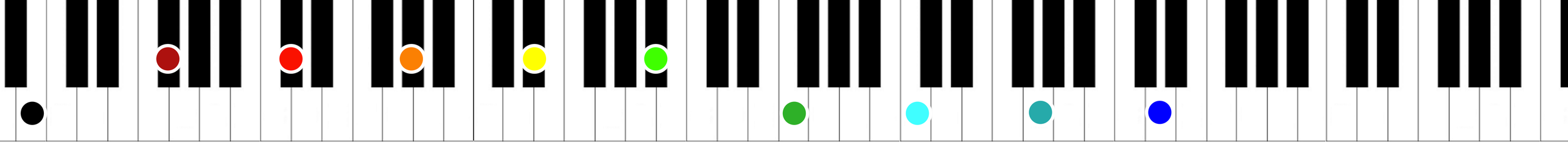

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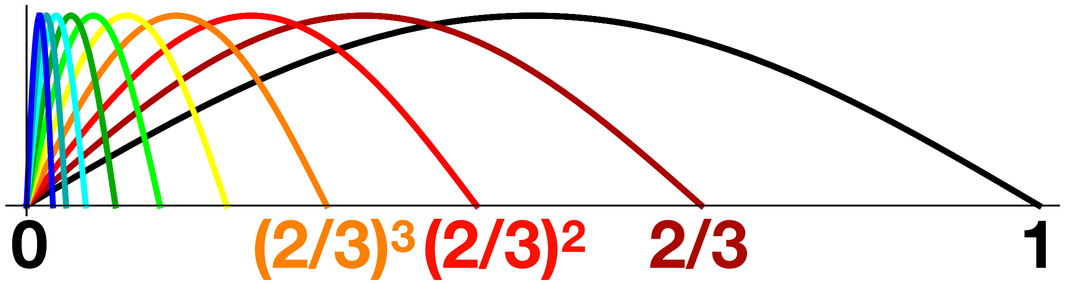

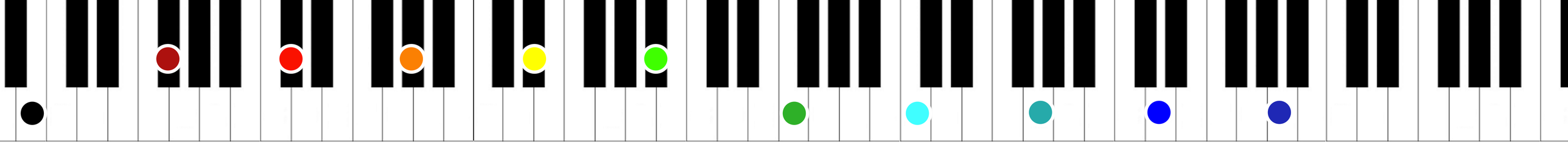

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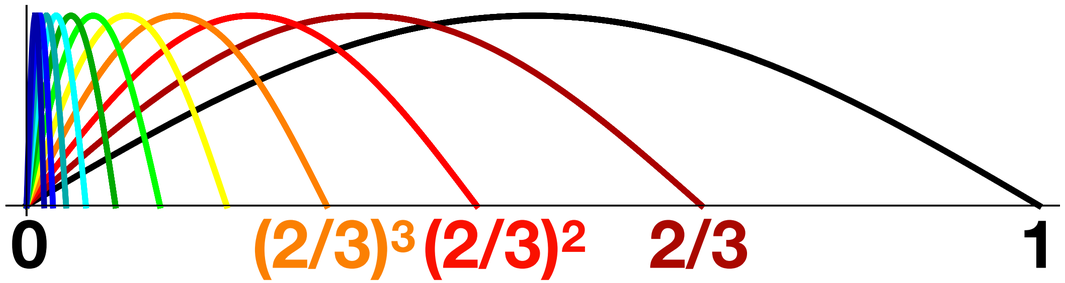

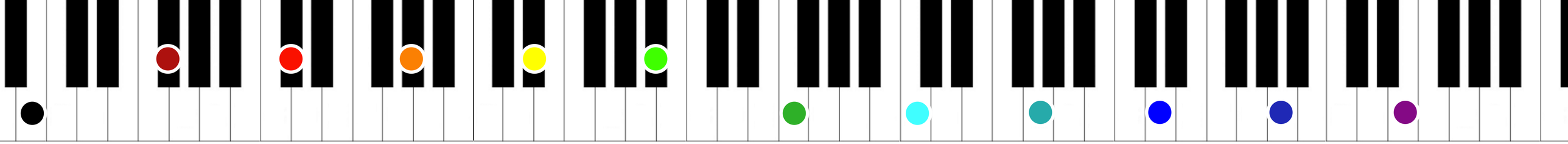

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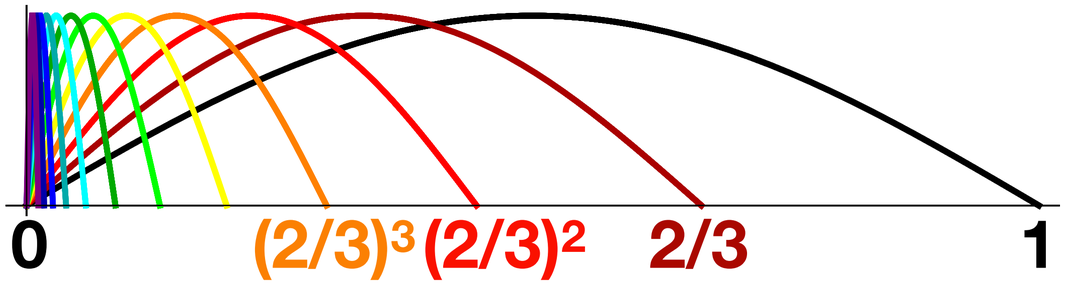

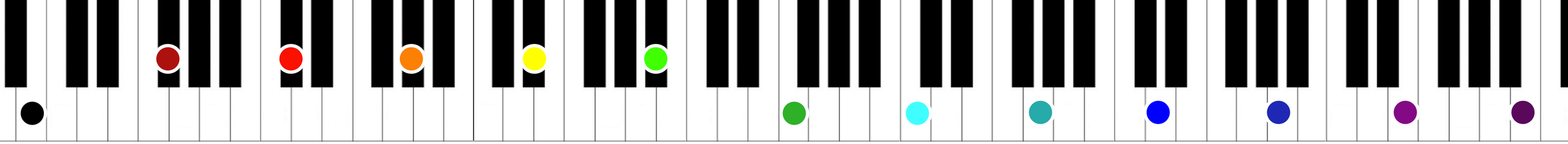

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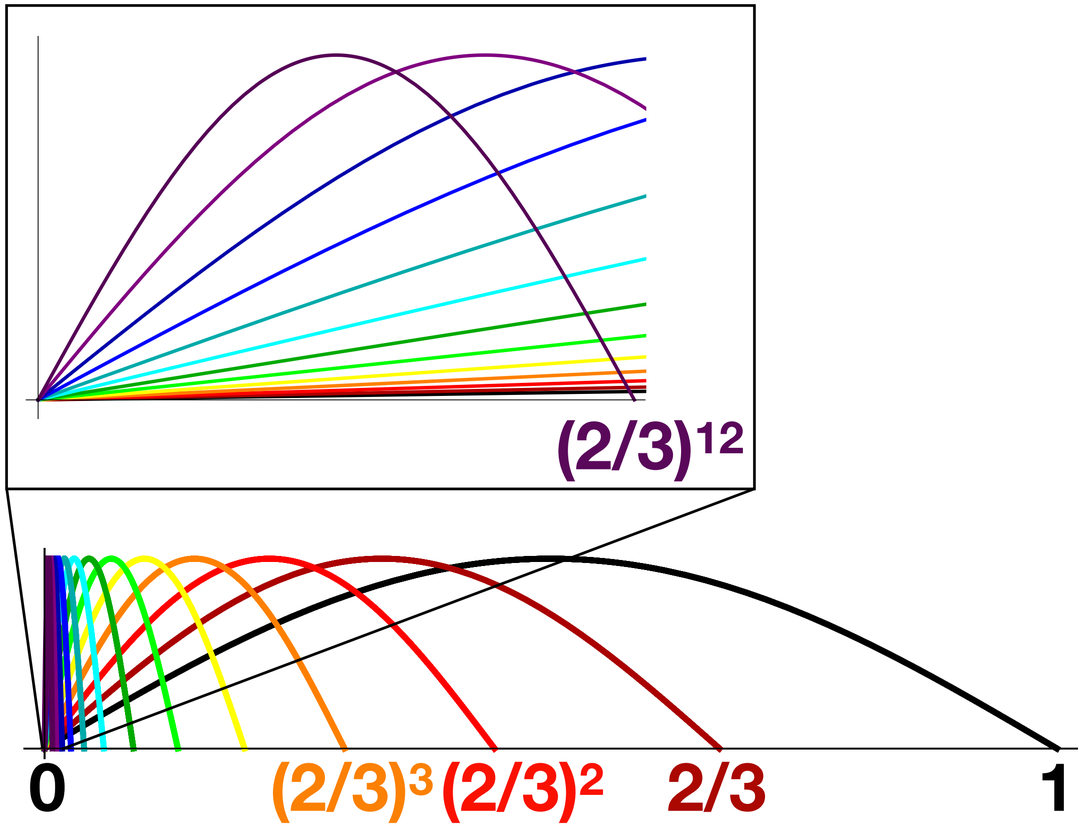

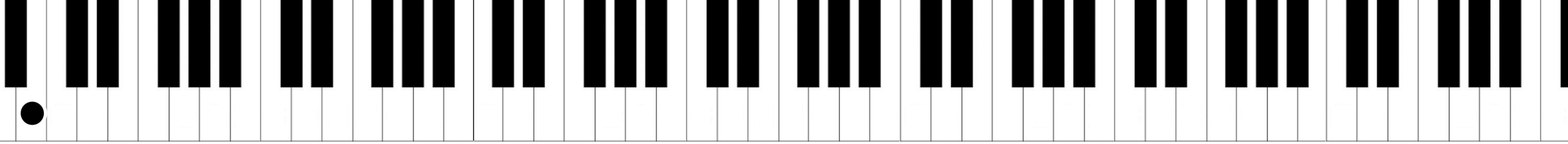

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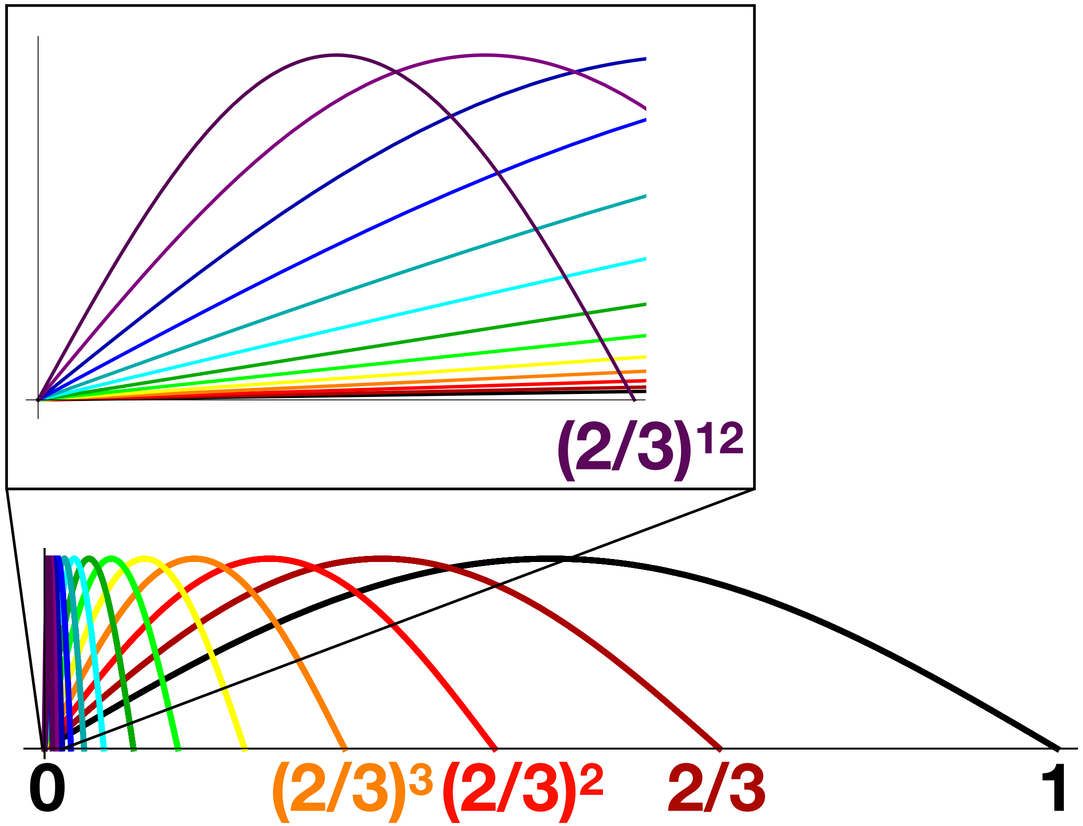
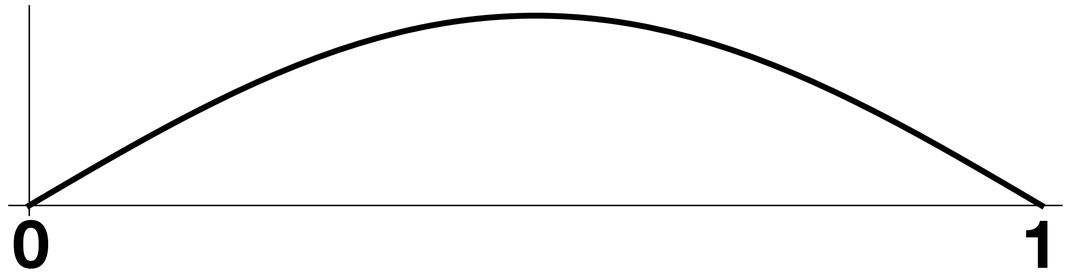
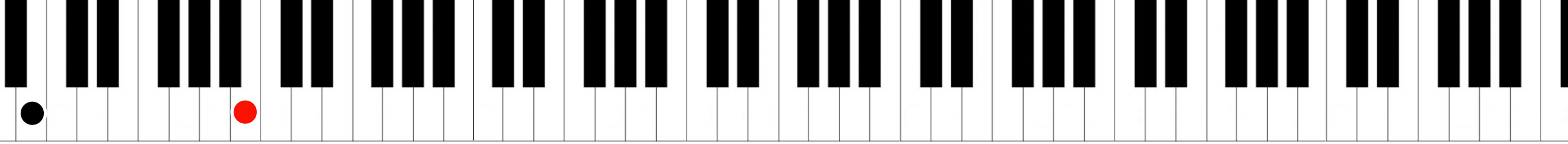


Comparison to “cycle” of octaves





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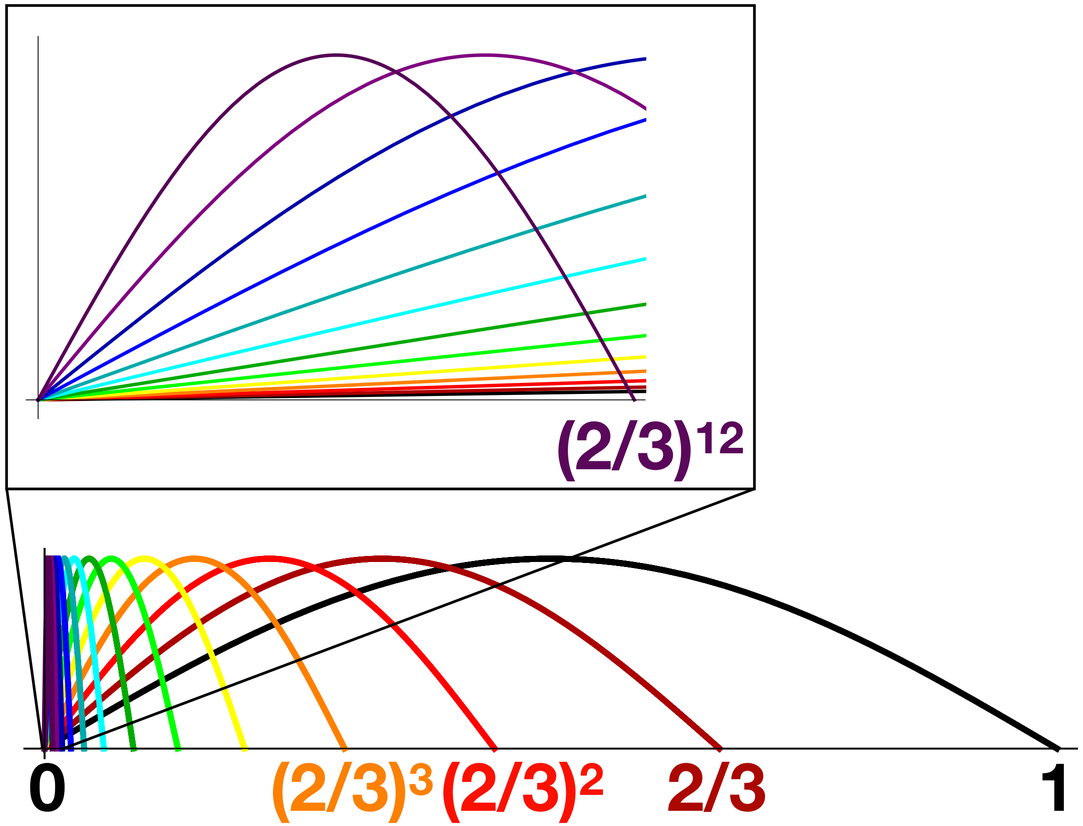

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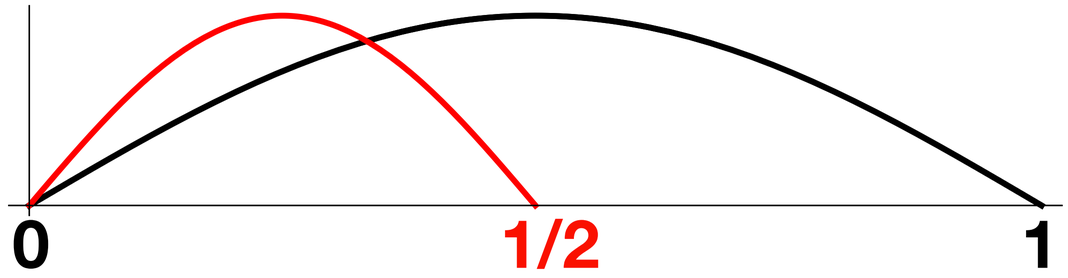

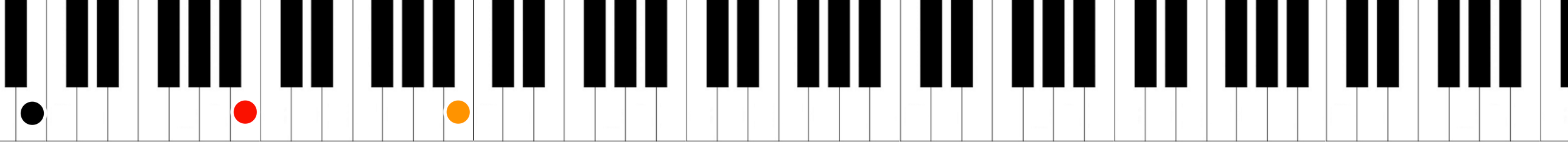

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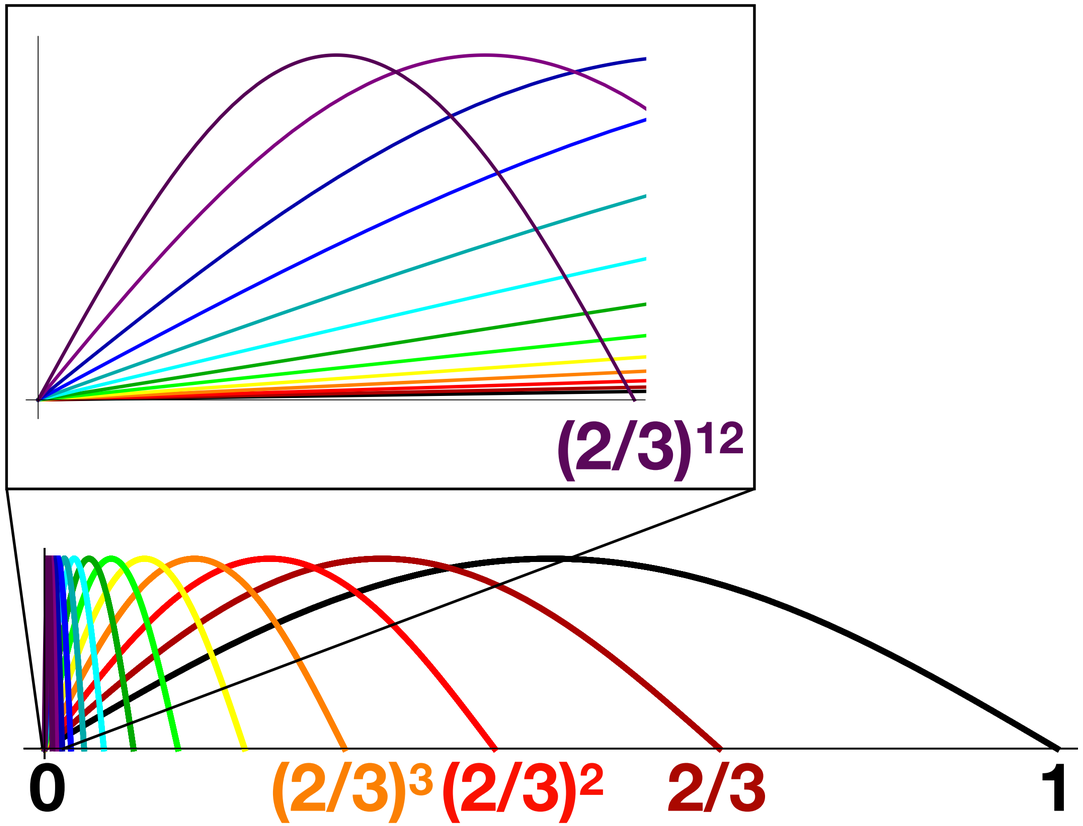

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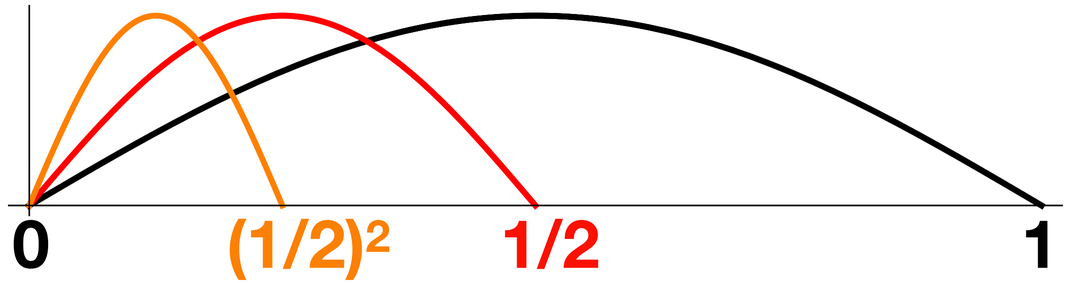

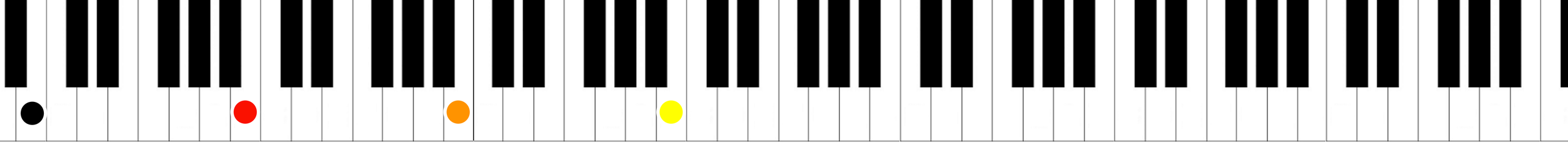

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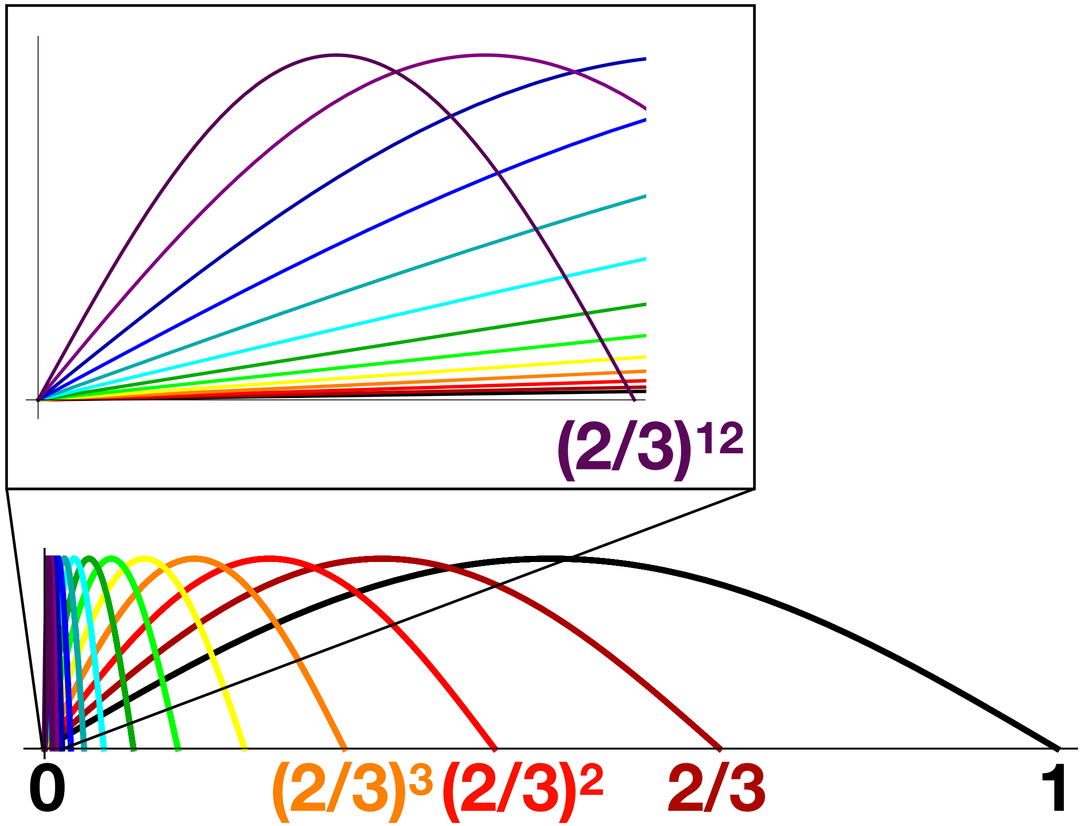

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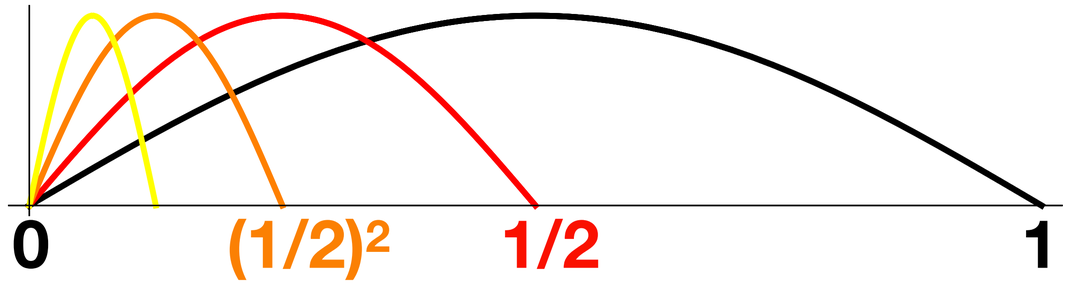

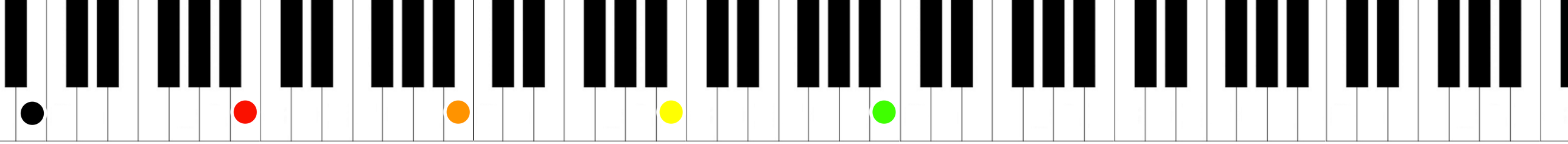

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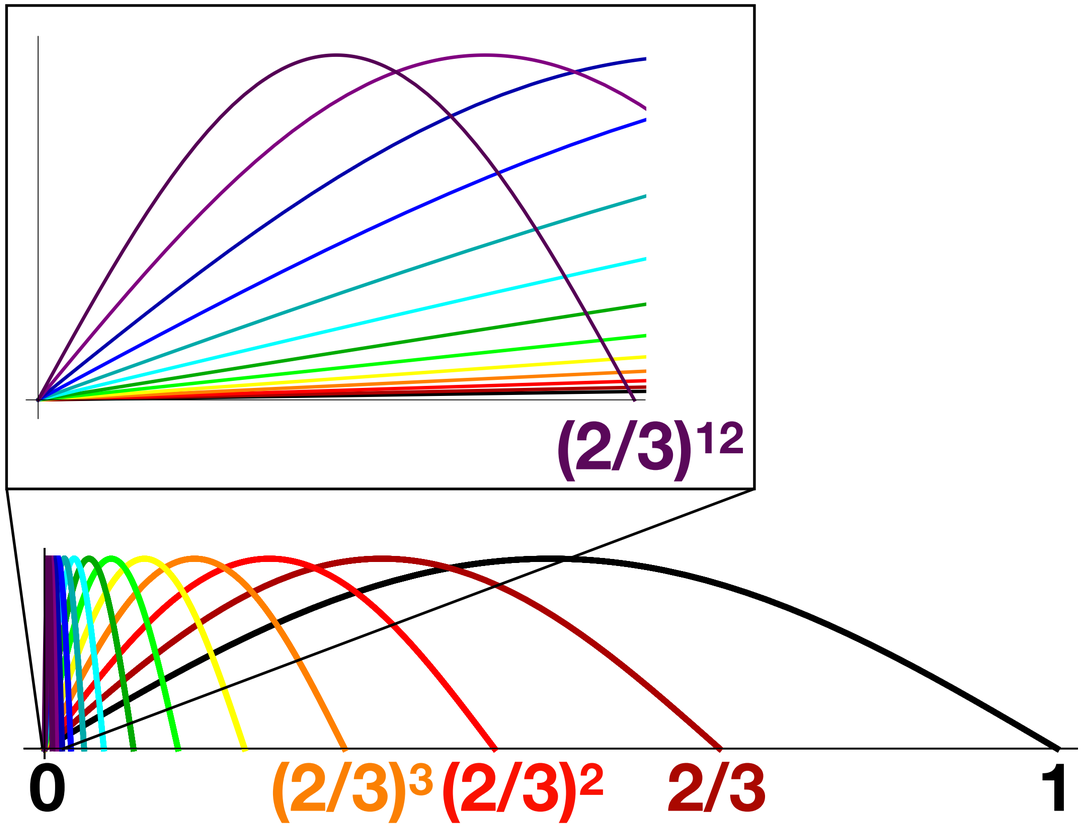

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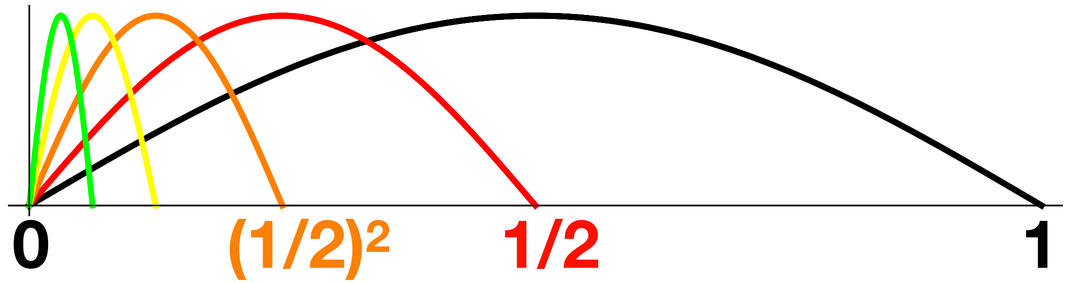

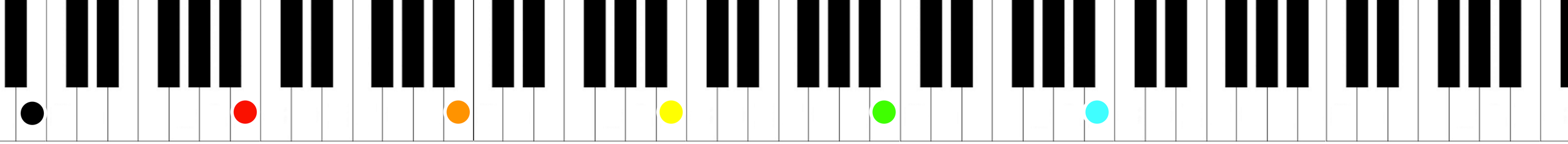

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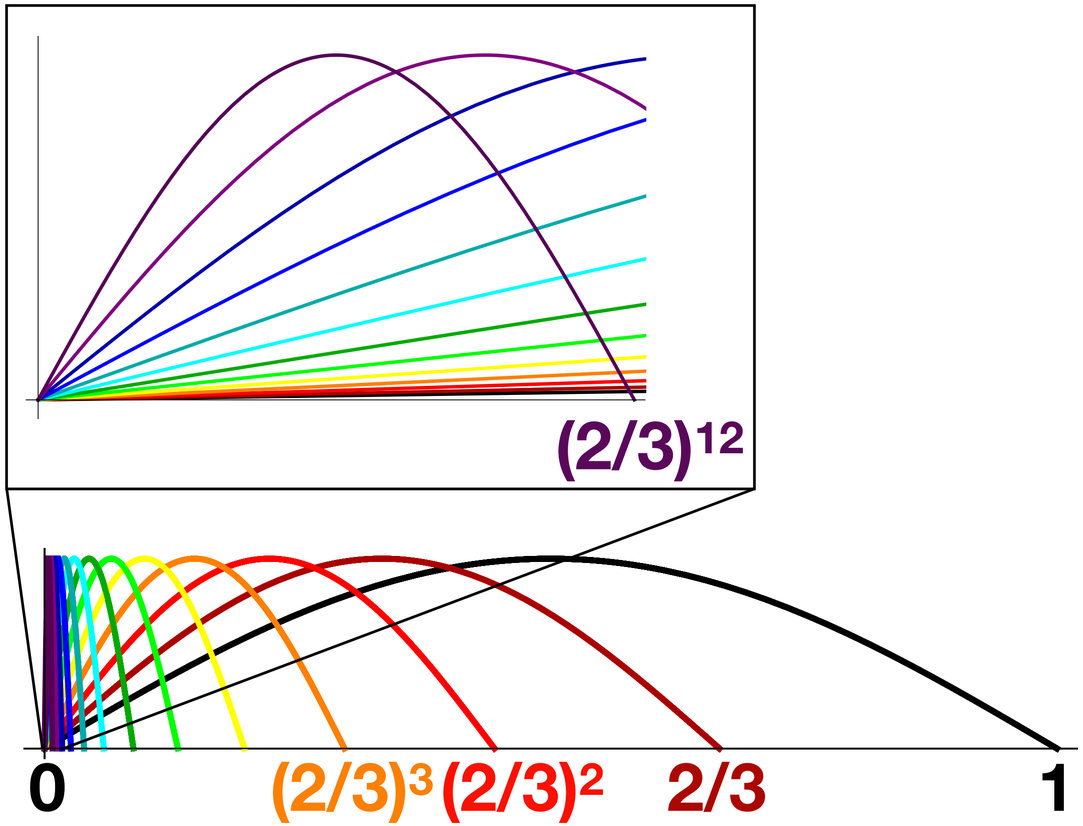

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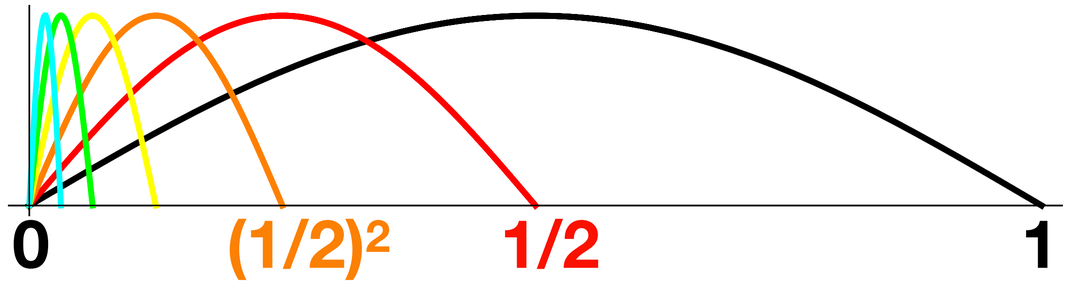

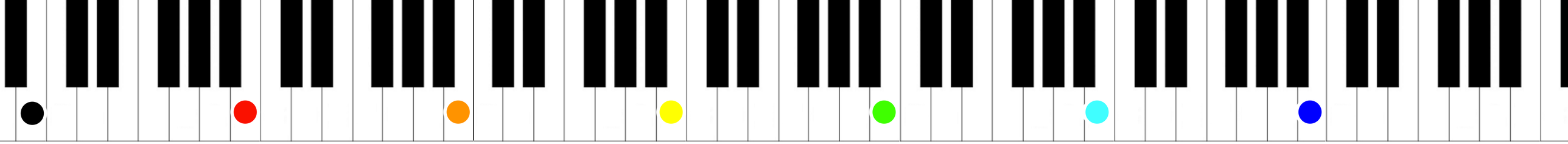

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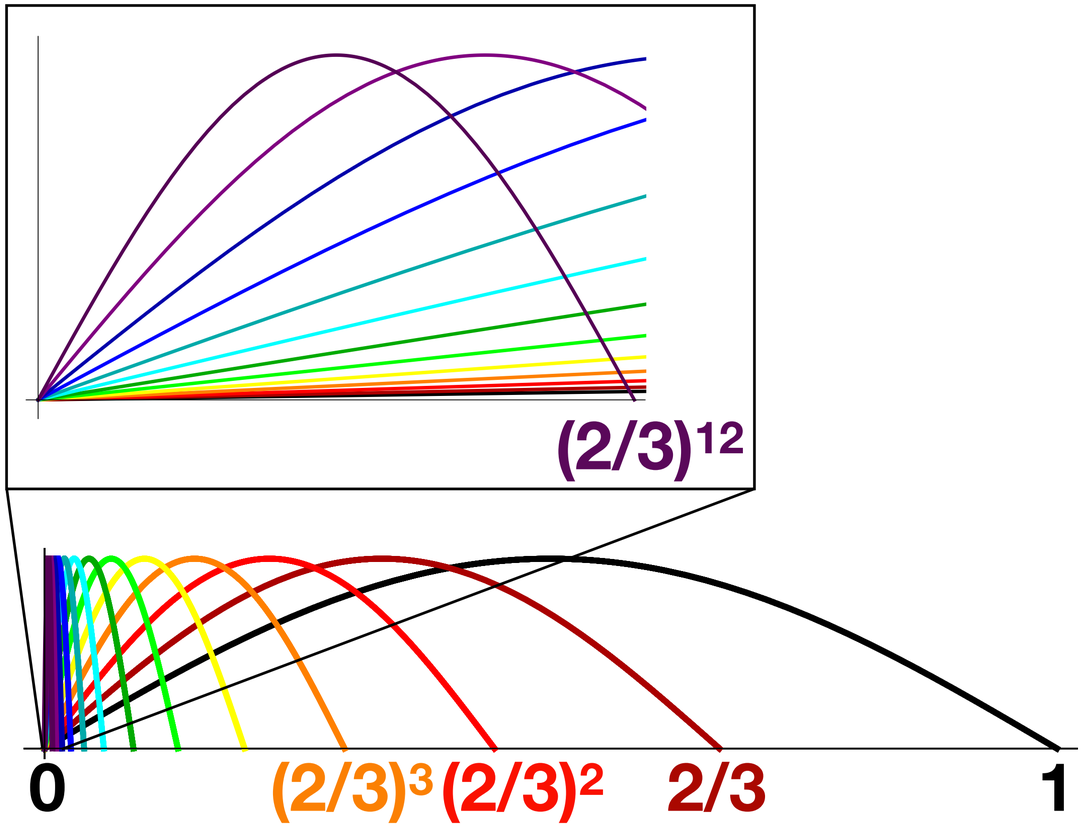

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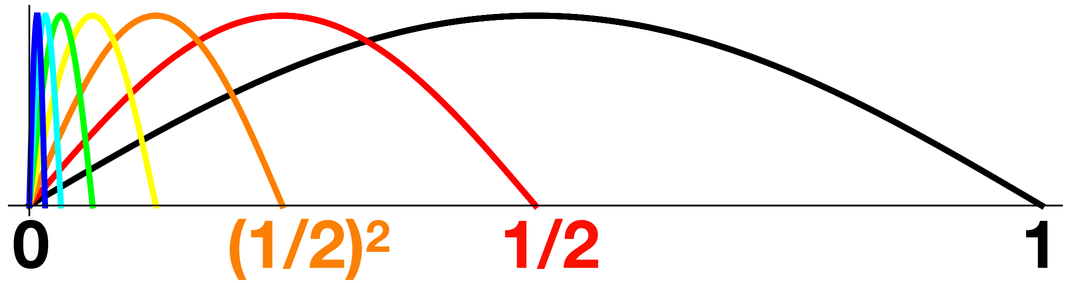

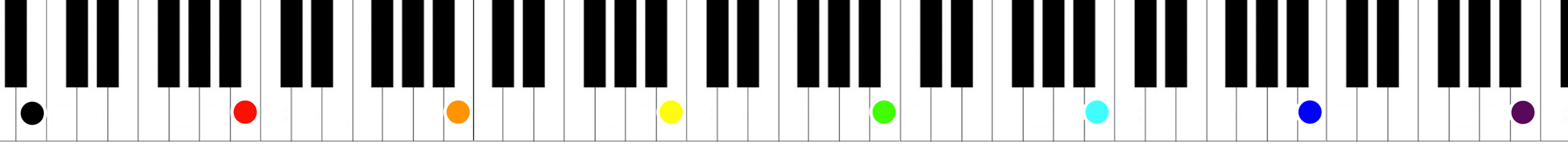

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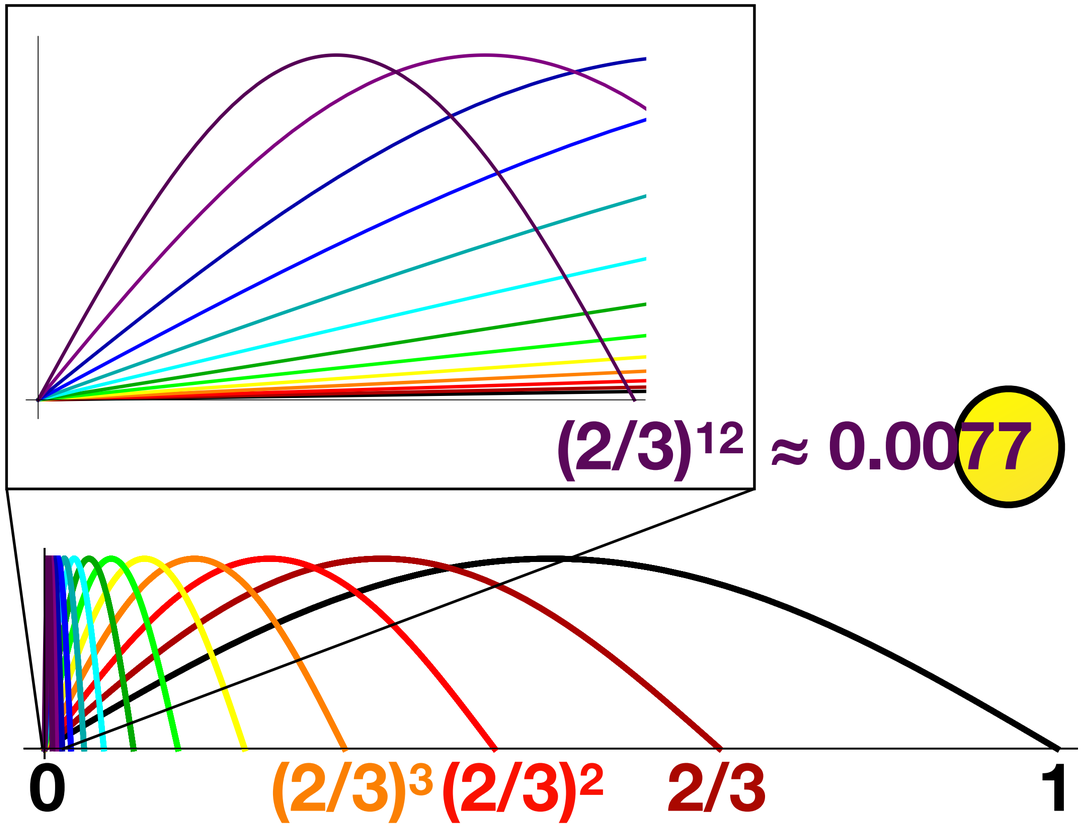

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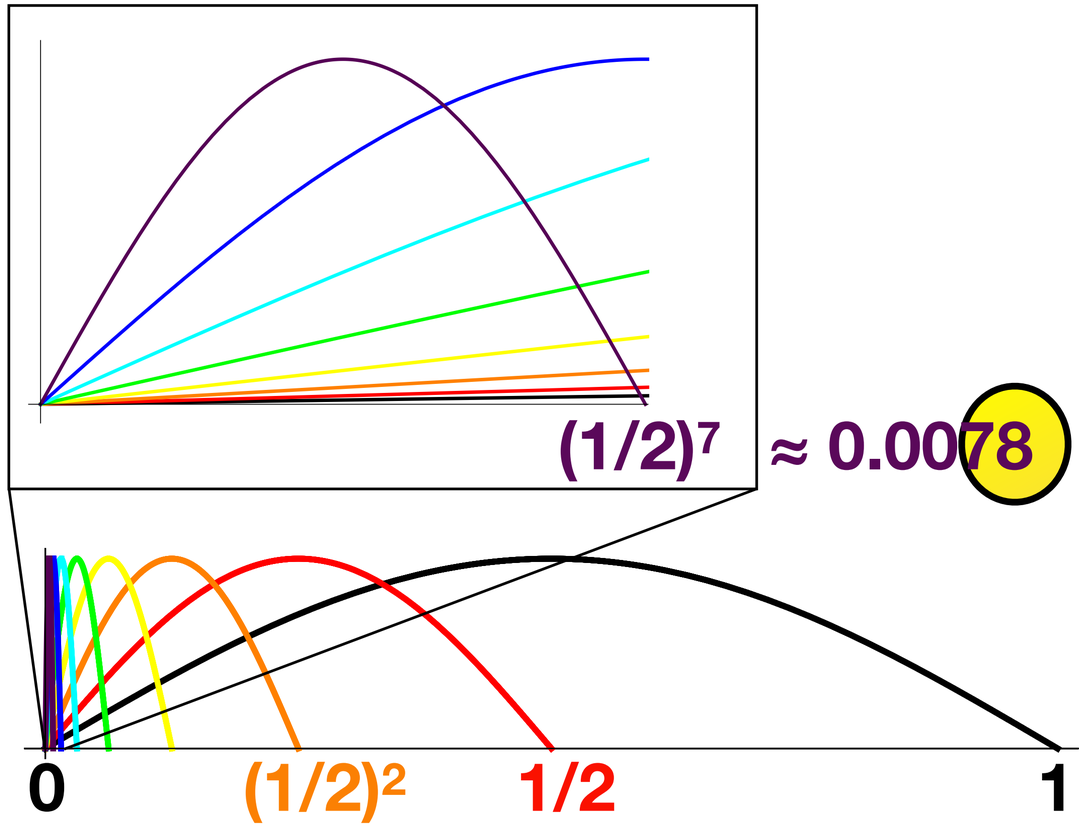
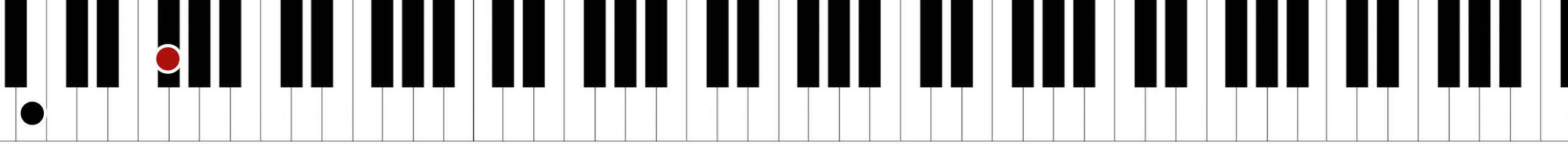
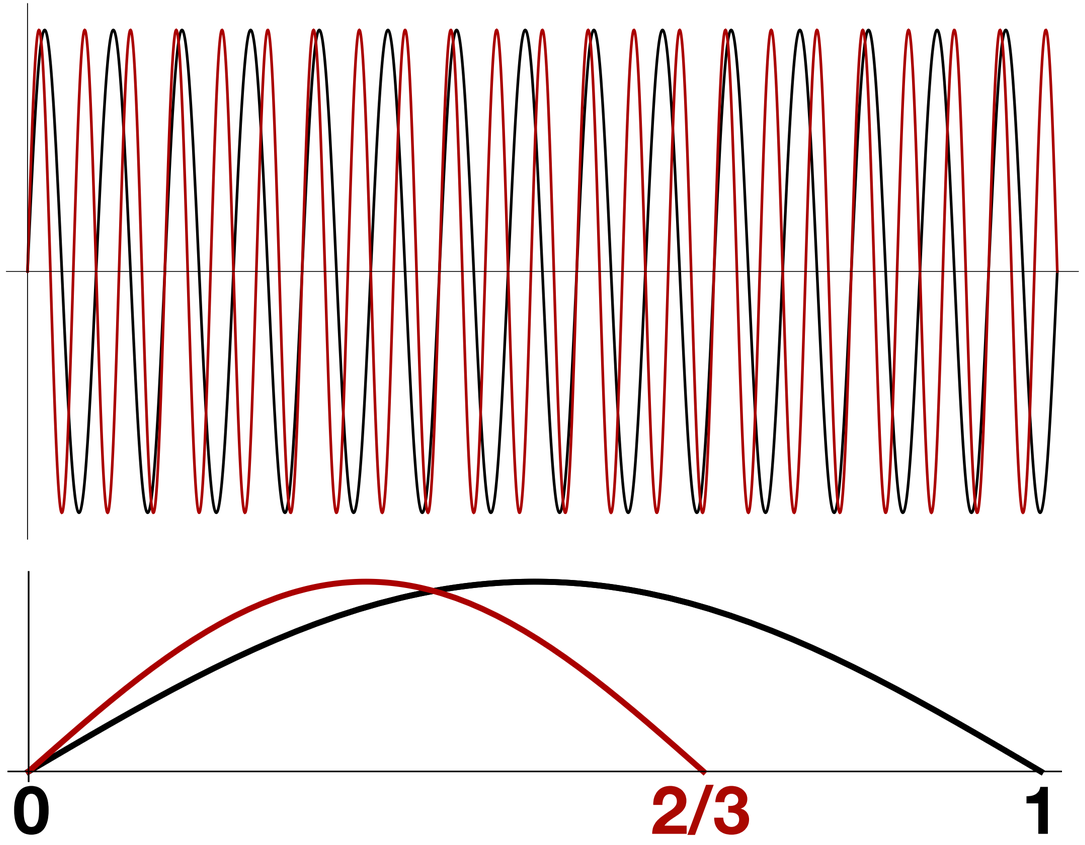


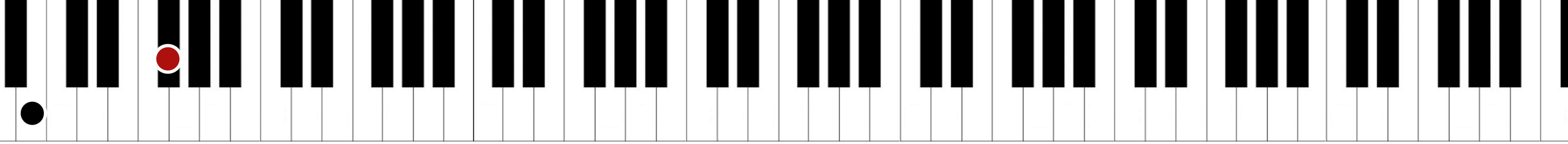


commensurate intervals (e.g. Young temperament)



(Pythagorean fifth)

incommensurate intervals (equal temperament)



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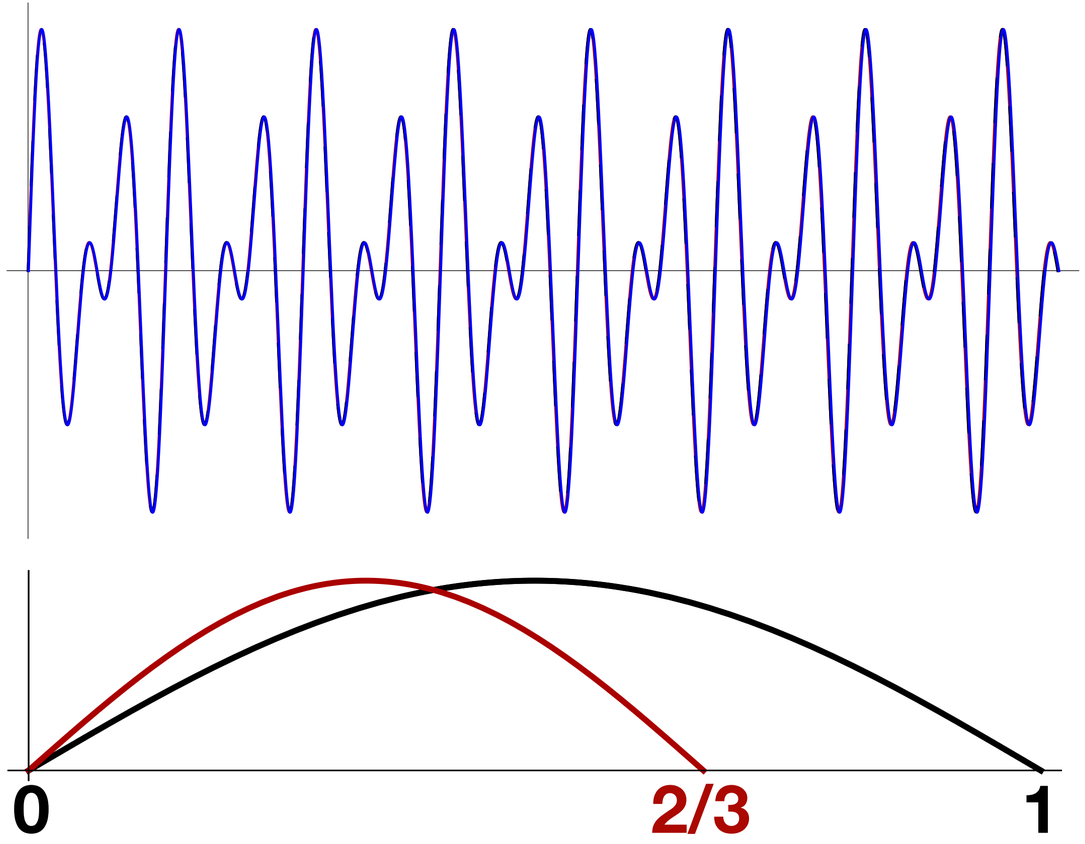

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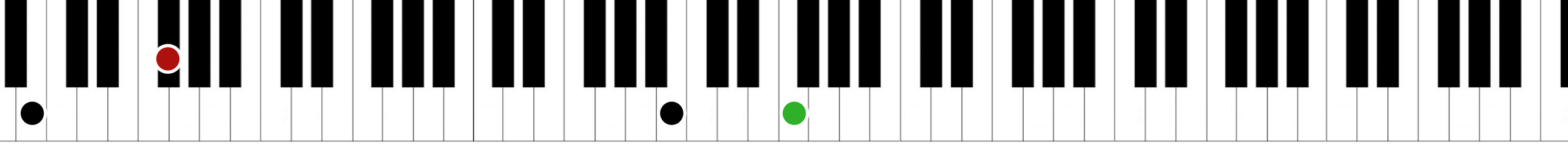

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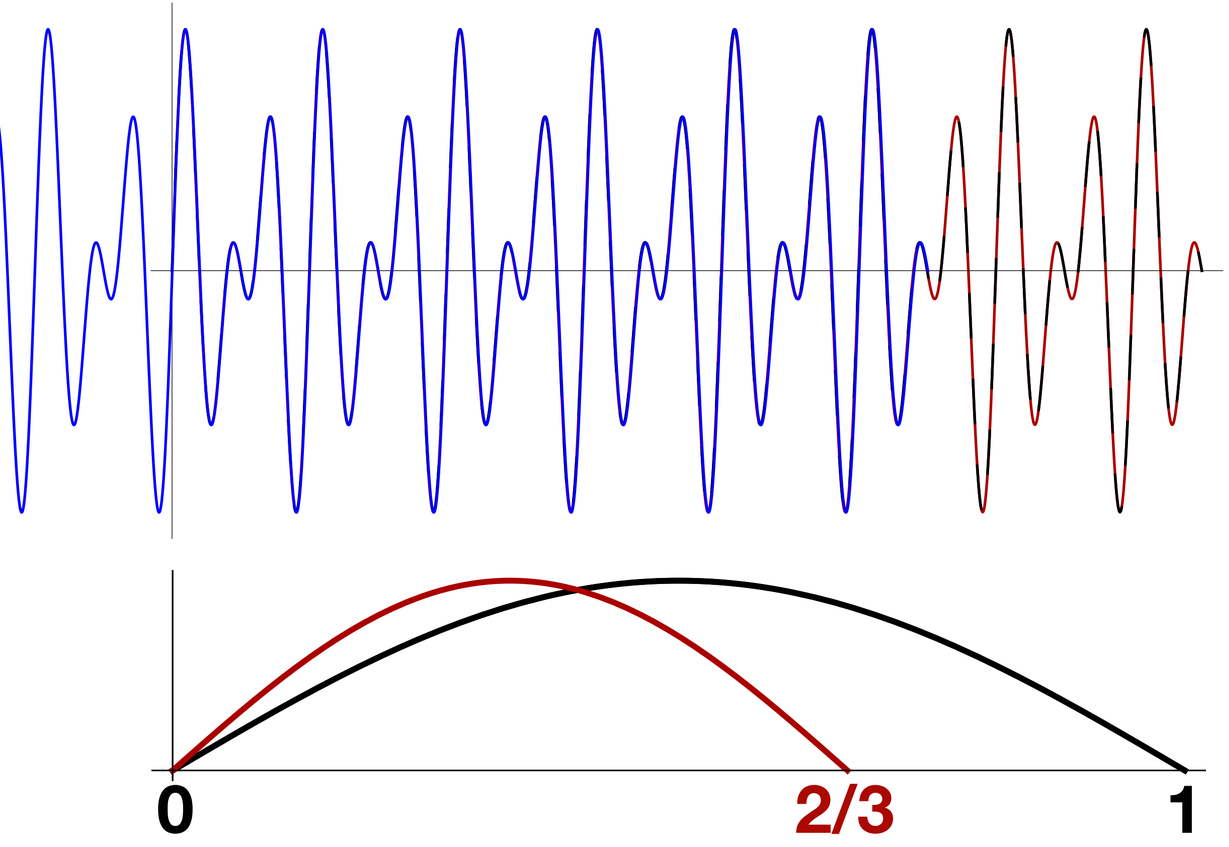
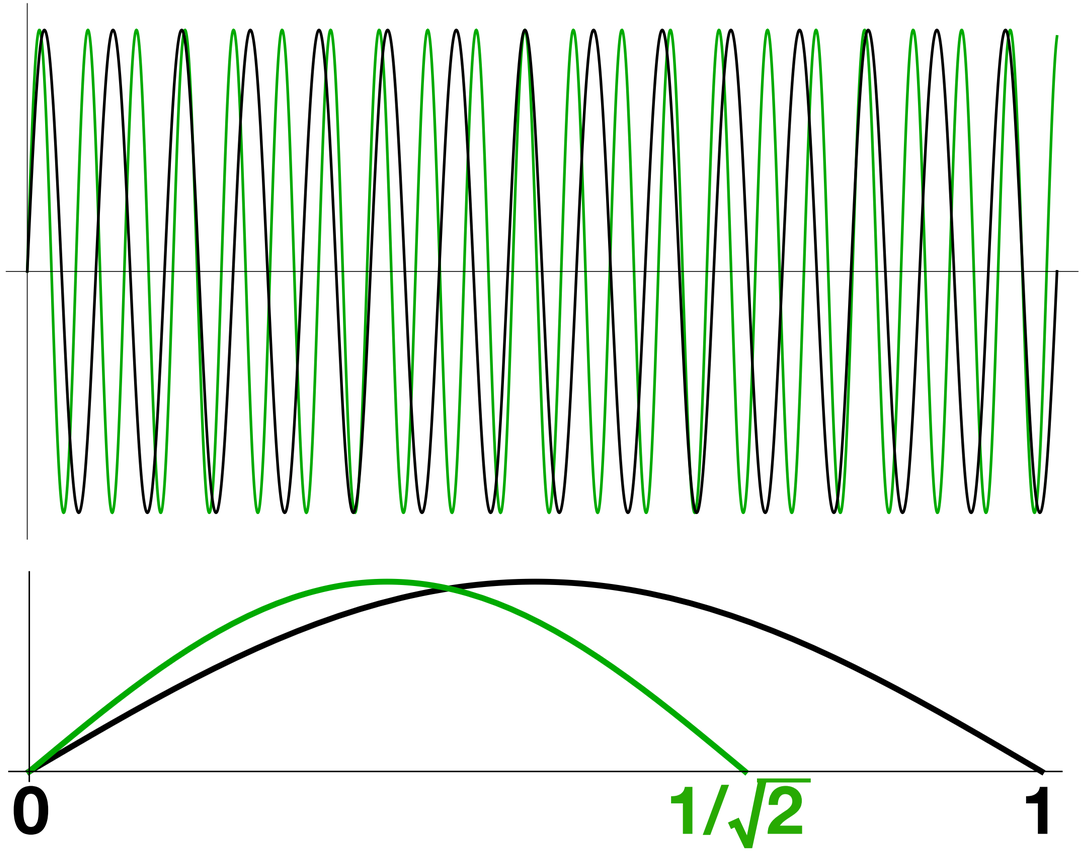
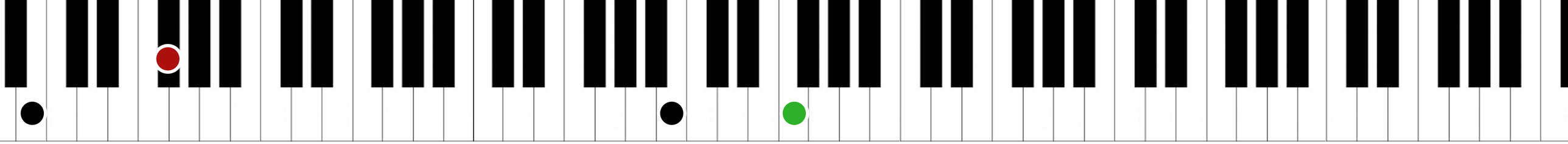


(Pythagorean fifth)

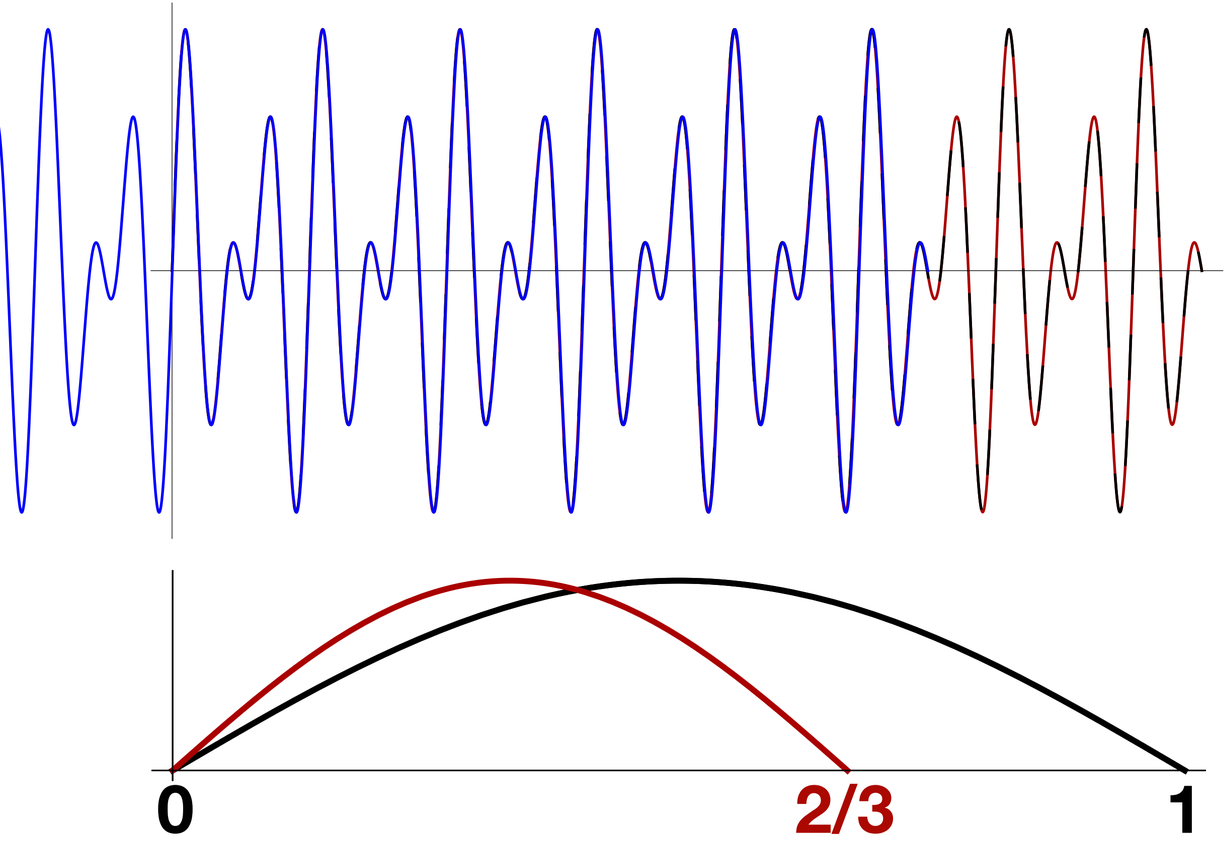
incommensurate intervals (equal temperament)



(Equal temperament tritone)

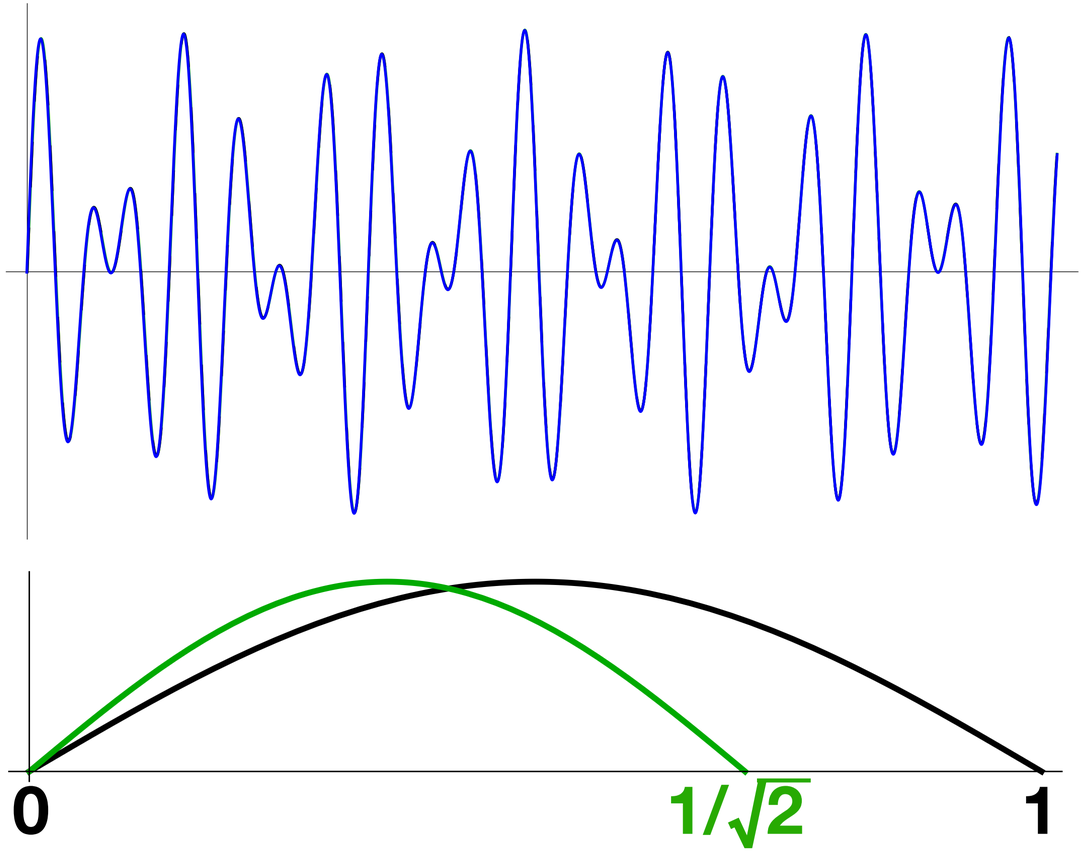


commensurate intervals (e.g. Young temperament)

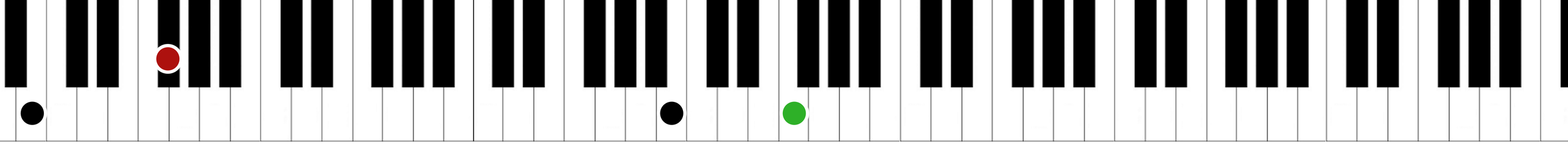


(Pythagorean fifth)

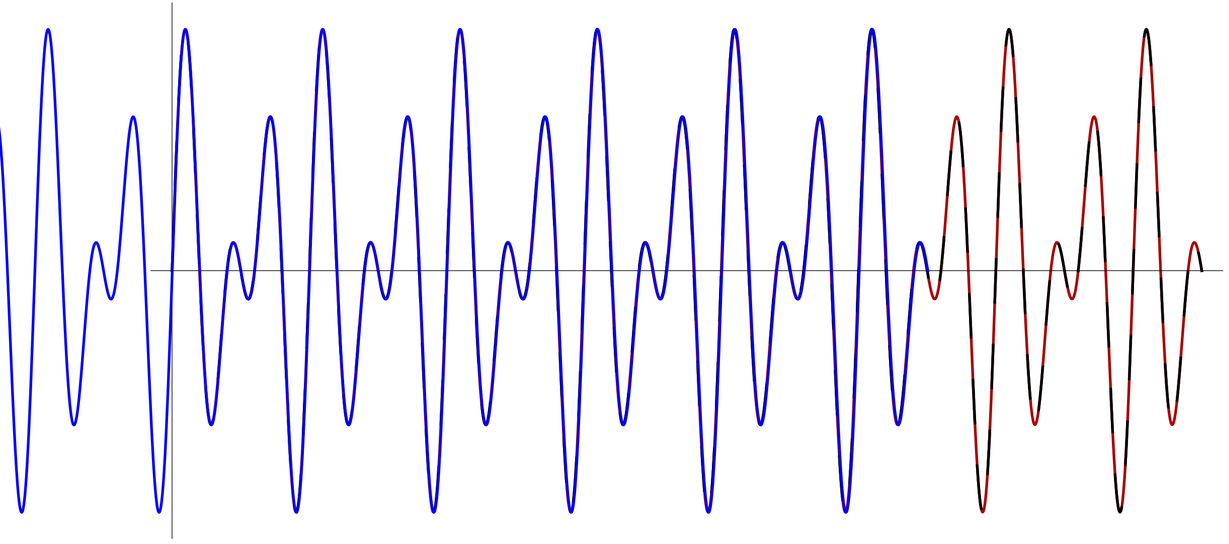
incommensurate intervals (equal temperament)

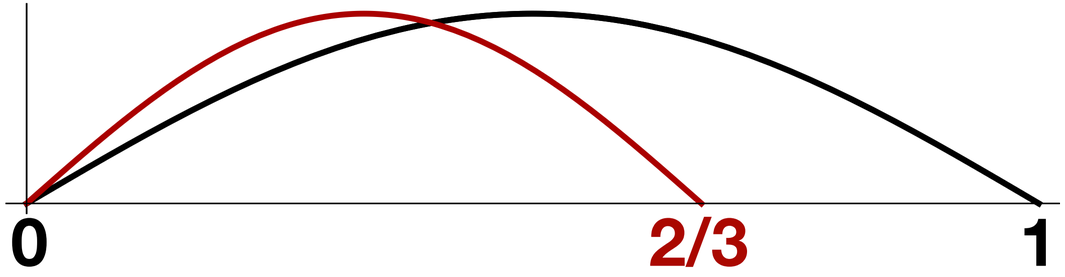


(Equal temperament tritone)



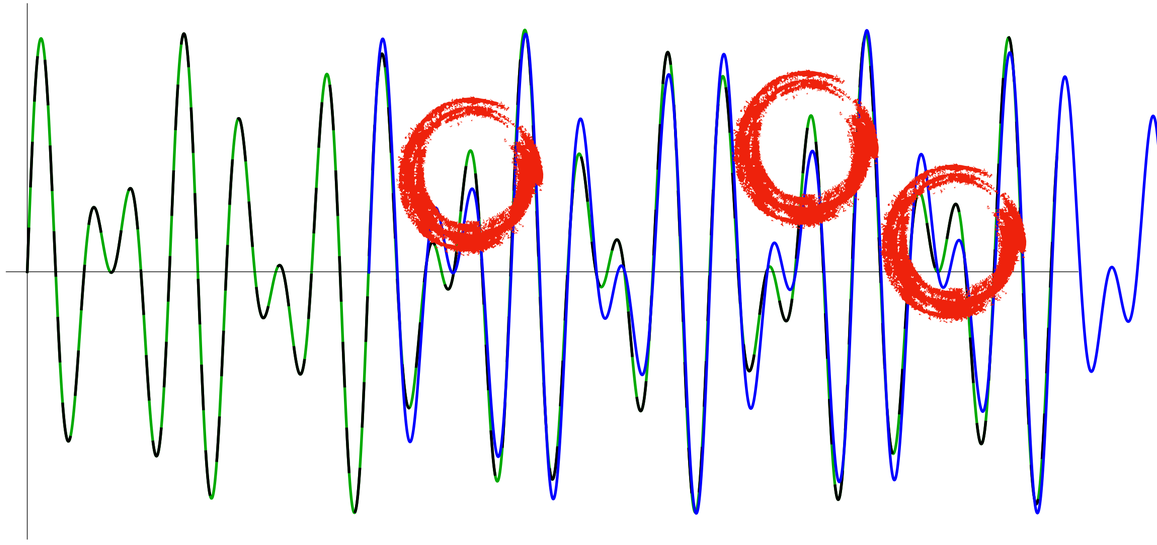
commensurate intervals (periodic repetitions)

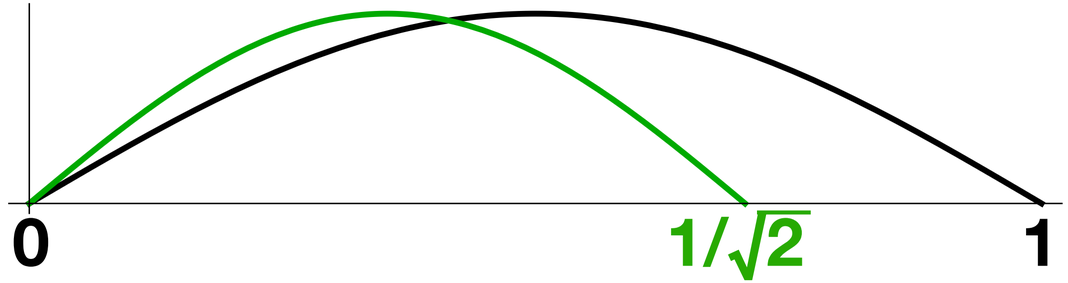




(Pythagorean fifth)

incommensurate intervals (aperiodic)

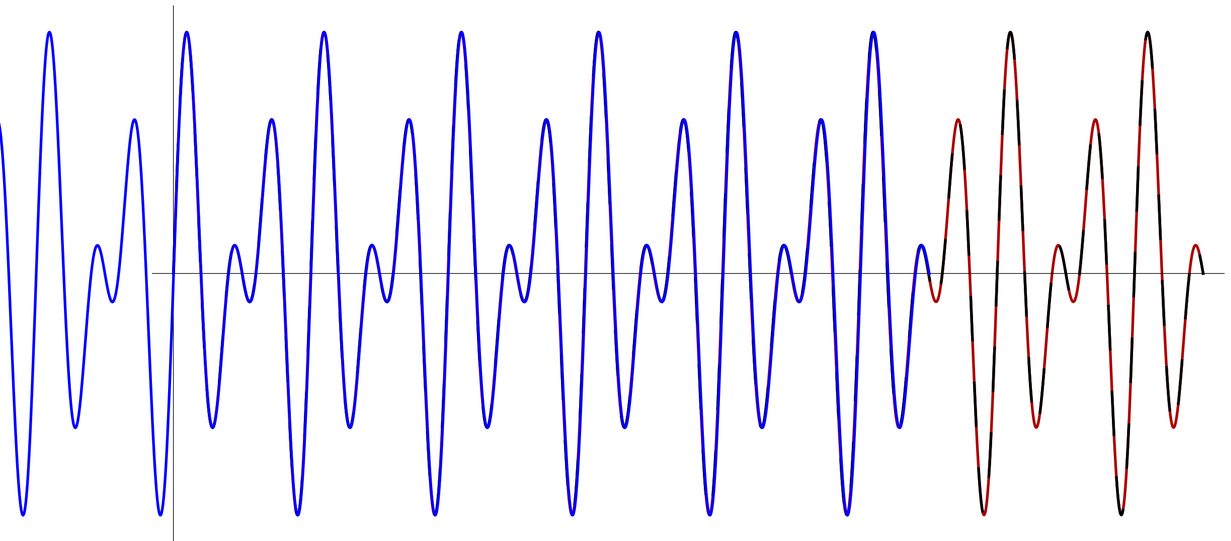




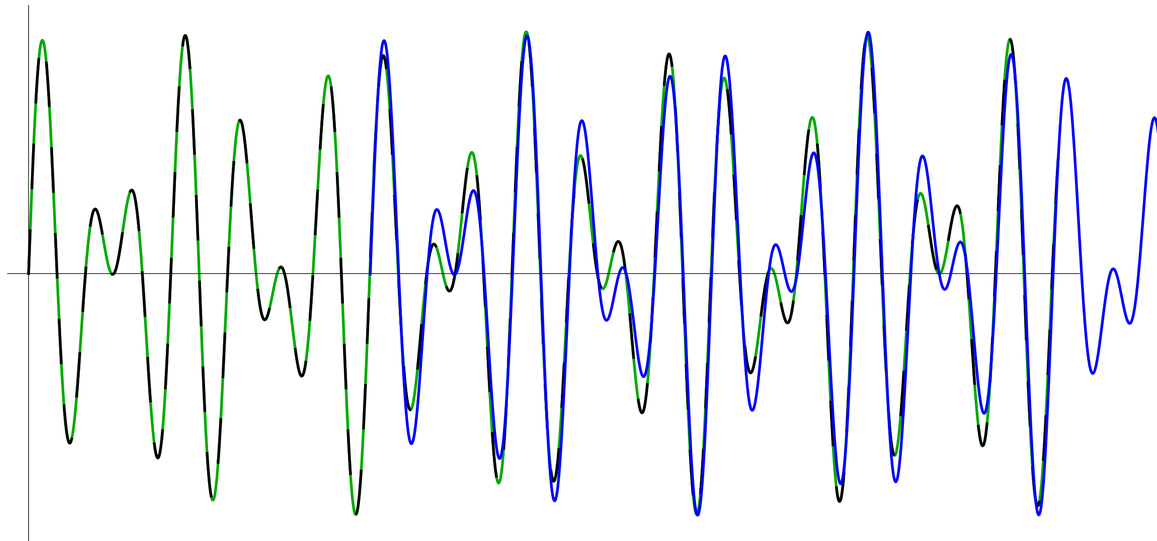
(Equal temperament tritone)

Quantum particles in…

…commensurate intervals (periodic repetitions)

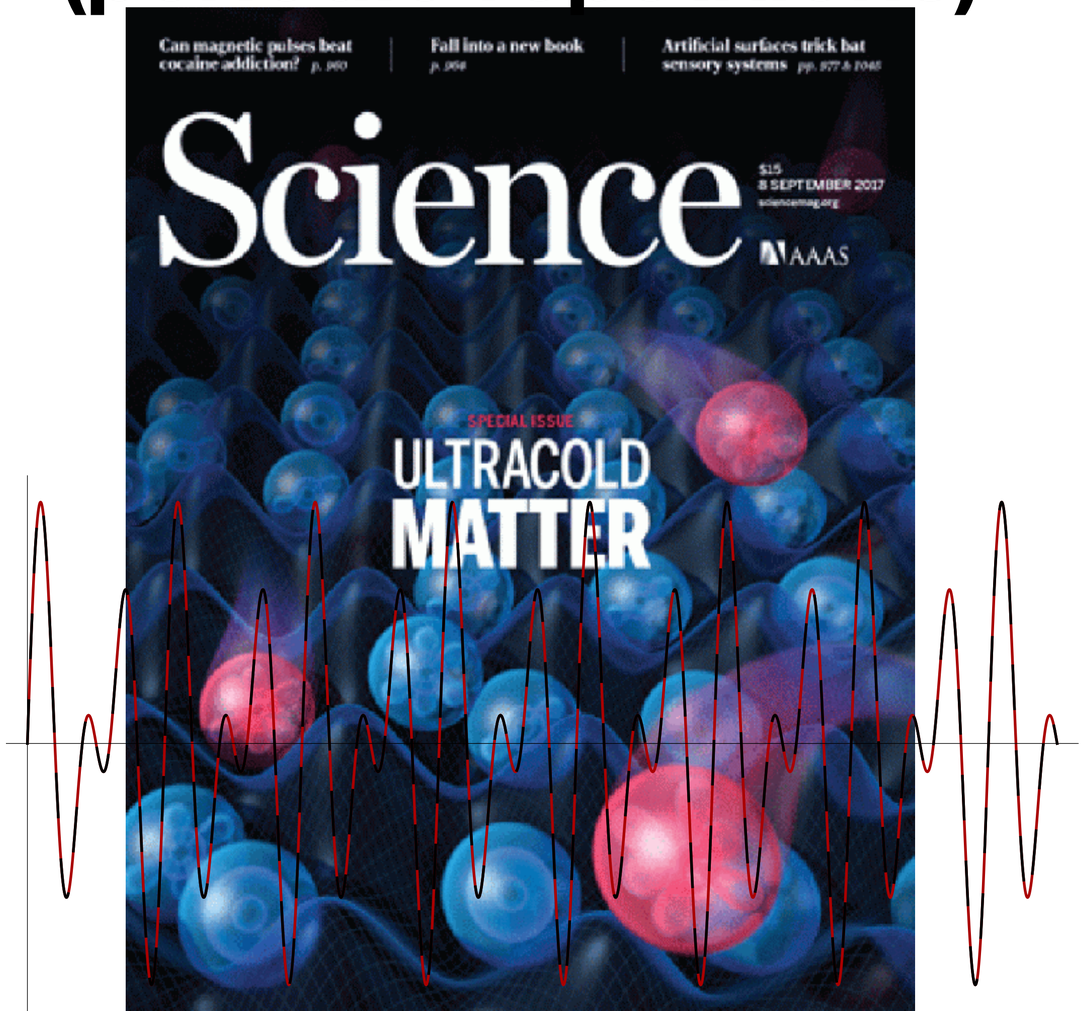


…incommensurate intervals (aperiodic)



Quantum particles in…

…commensurate intervals (periodic repetitions)

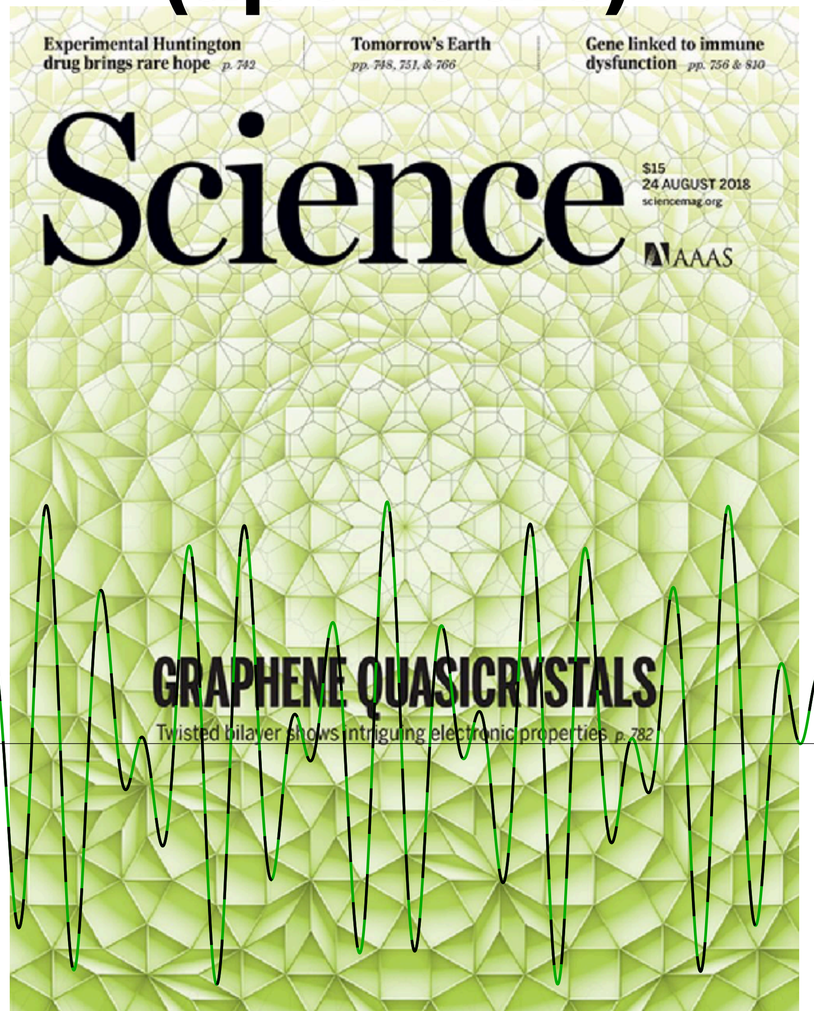


…incommensurate intervals (aperiodic)

Quantum particles in…

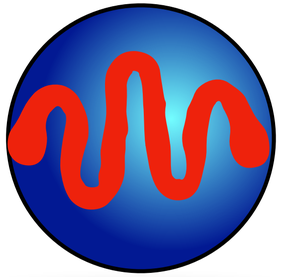
…crystals (periodic repetitions)

…quasicrystals (aperiodic)

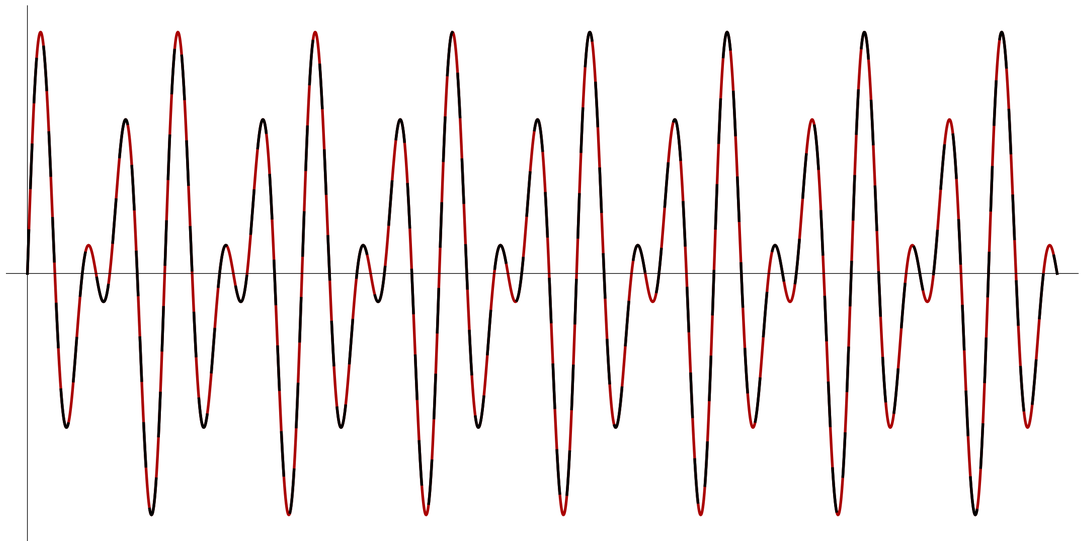


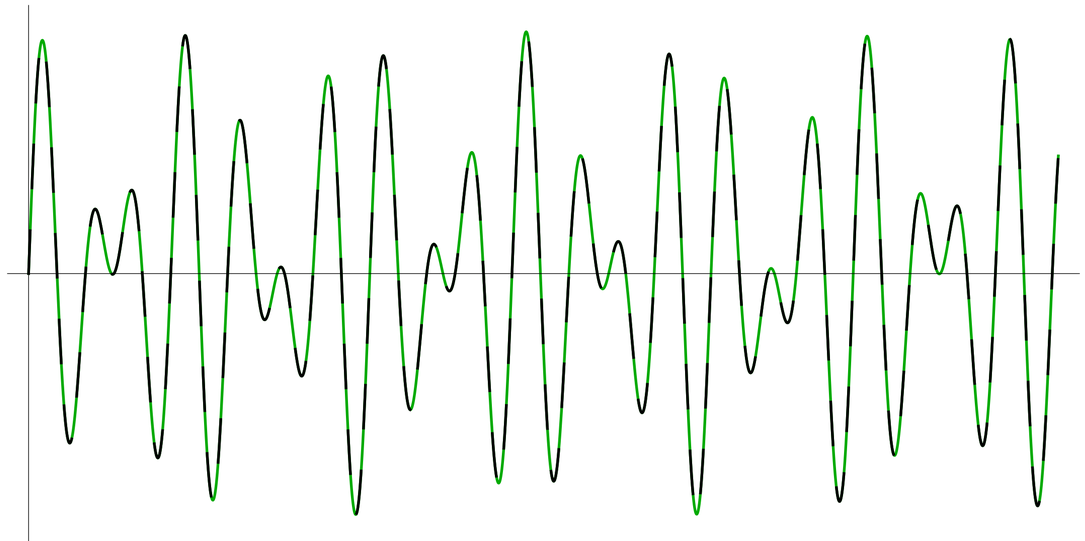
Quantum particles in…

…crystals
(periodic repetitions)



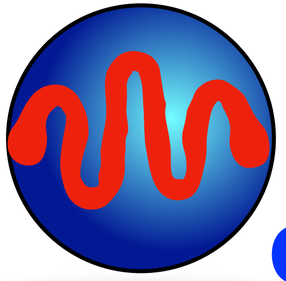
…quasicrystals
(aperiodic)





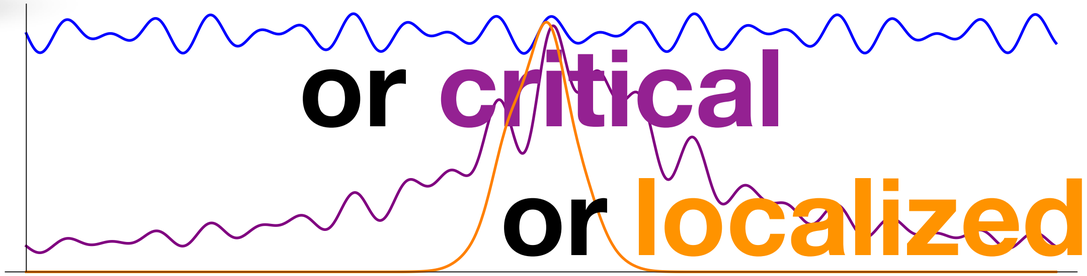
probabilities for quantum particles in…

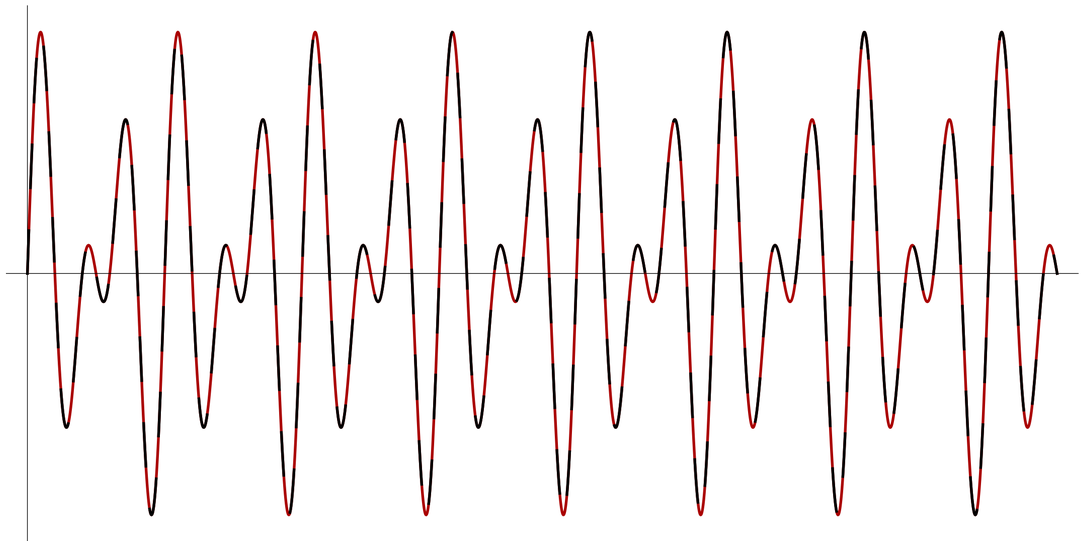
…crystals
(periodic repetitions)

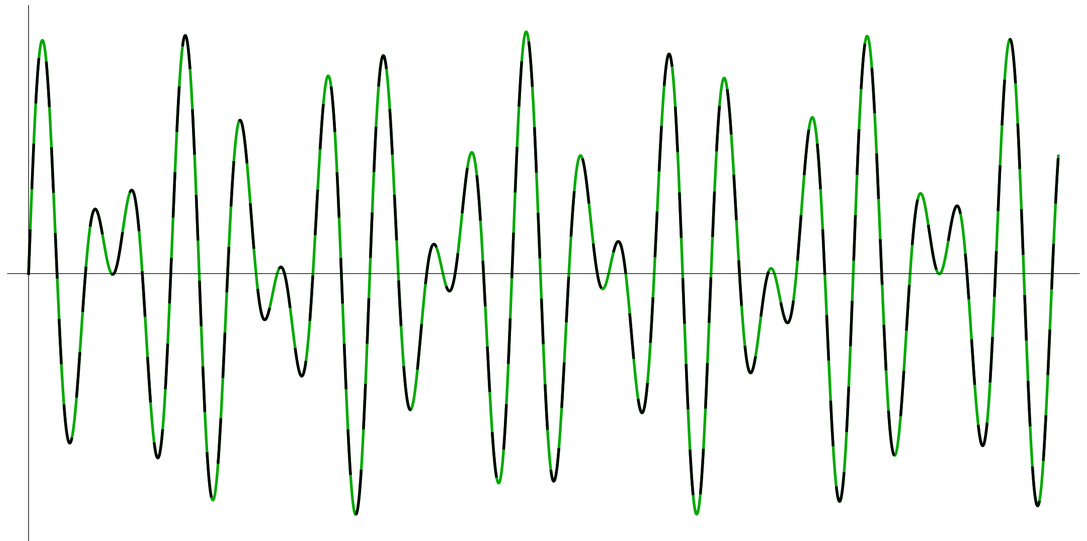


…quasicrystals
(aperiodic)

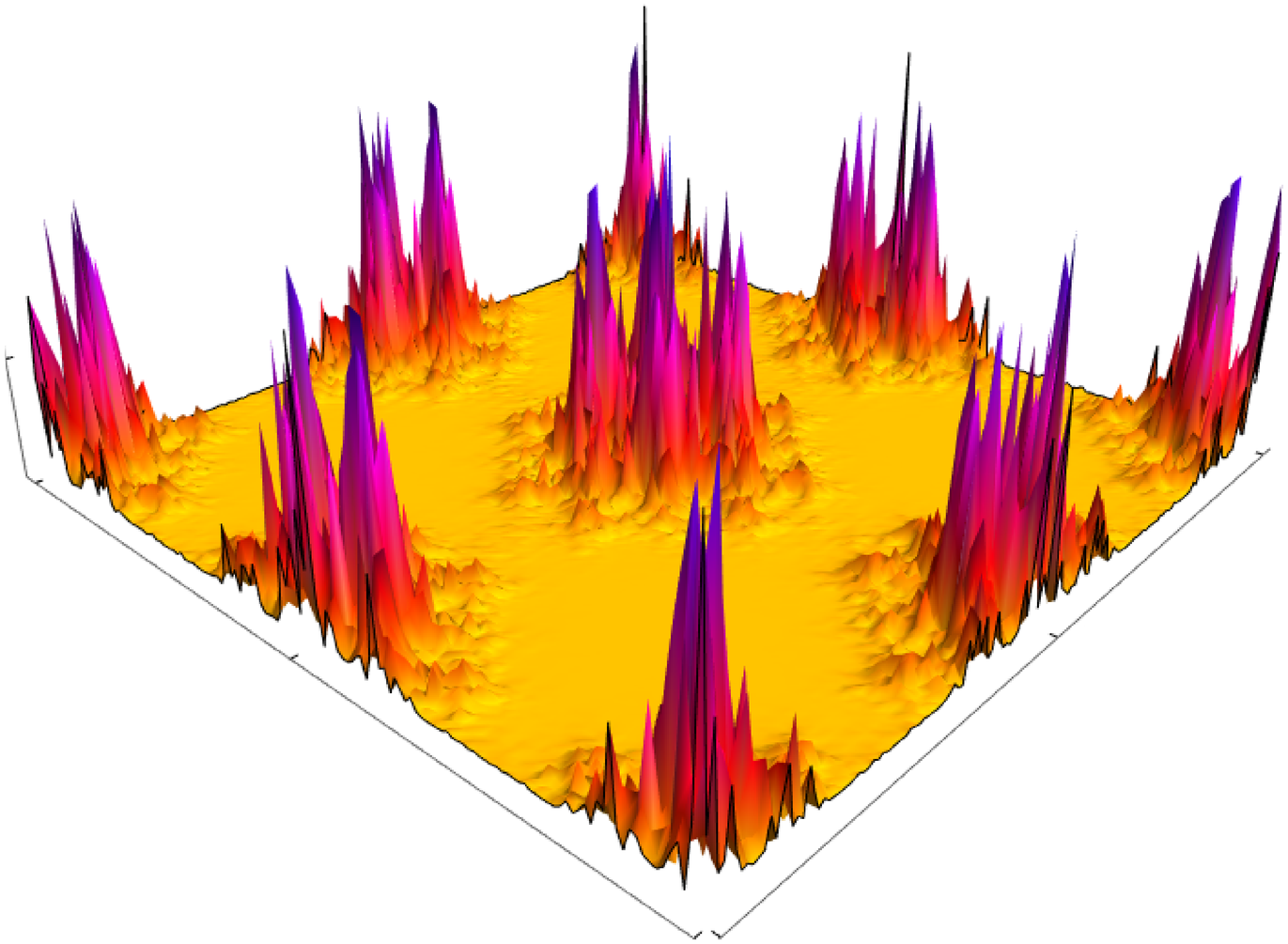
delocalized



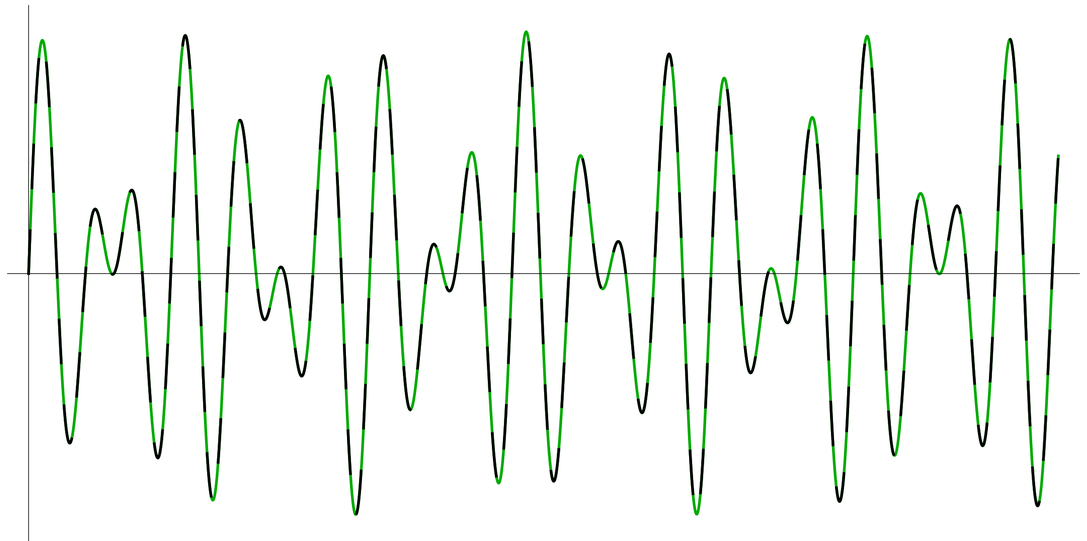




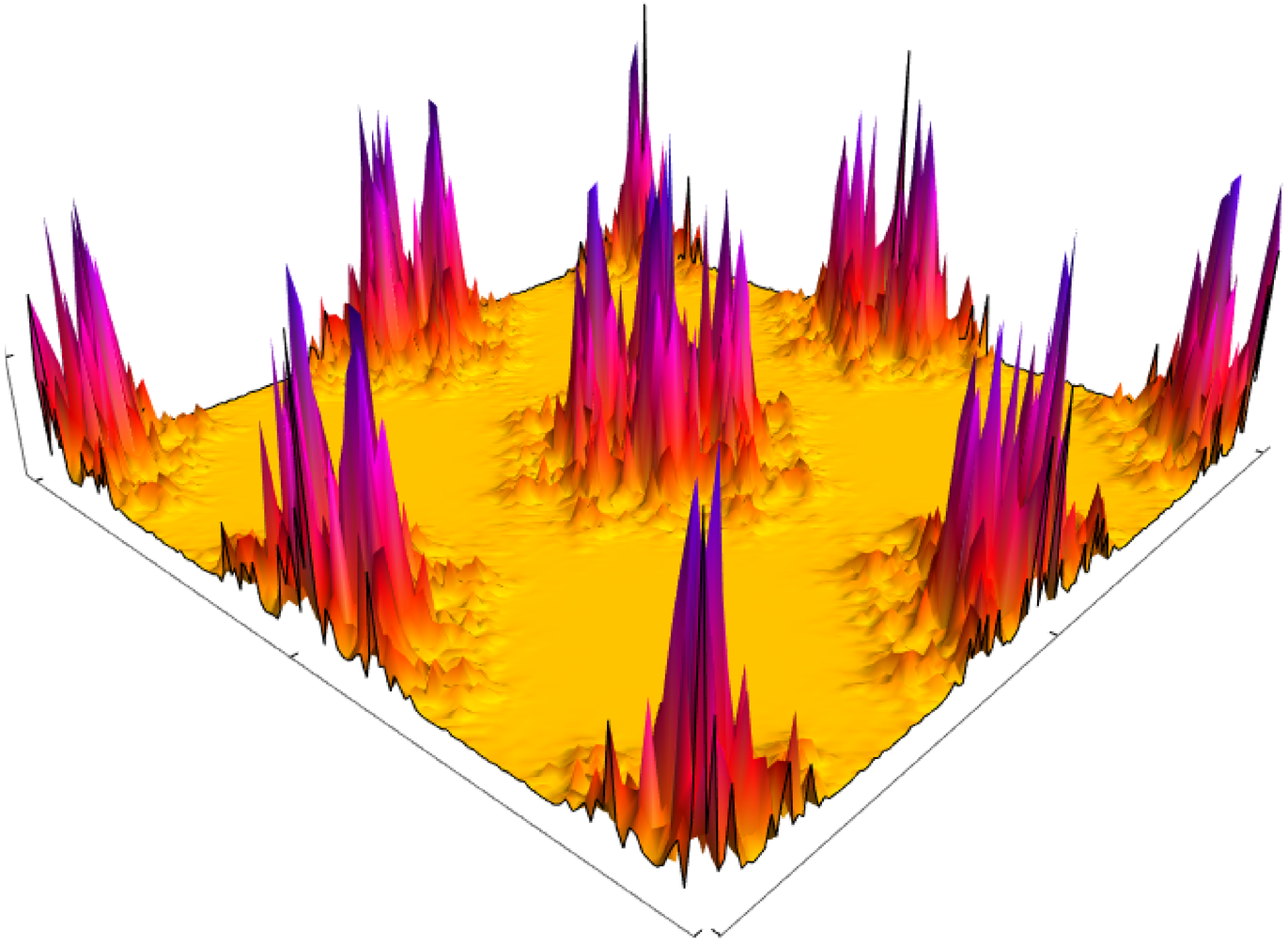
probabilities for quantum particles in…

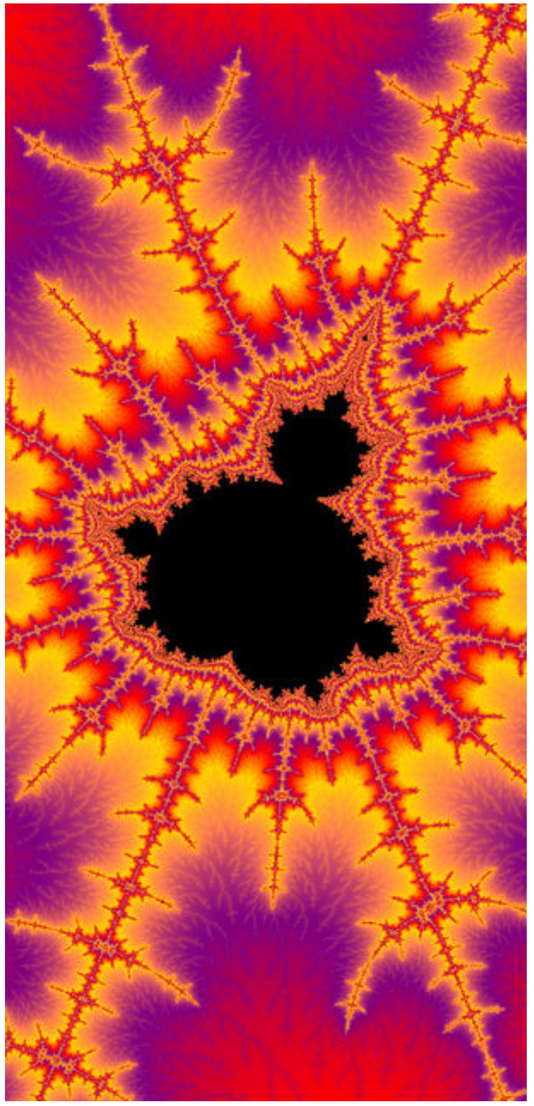


…quasicrystals
(aperiodic)

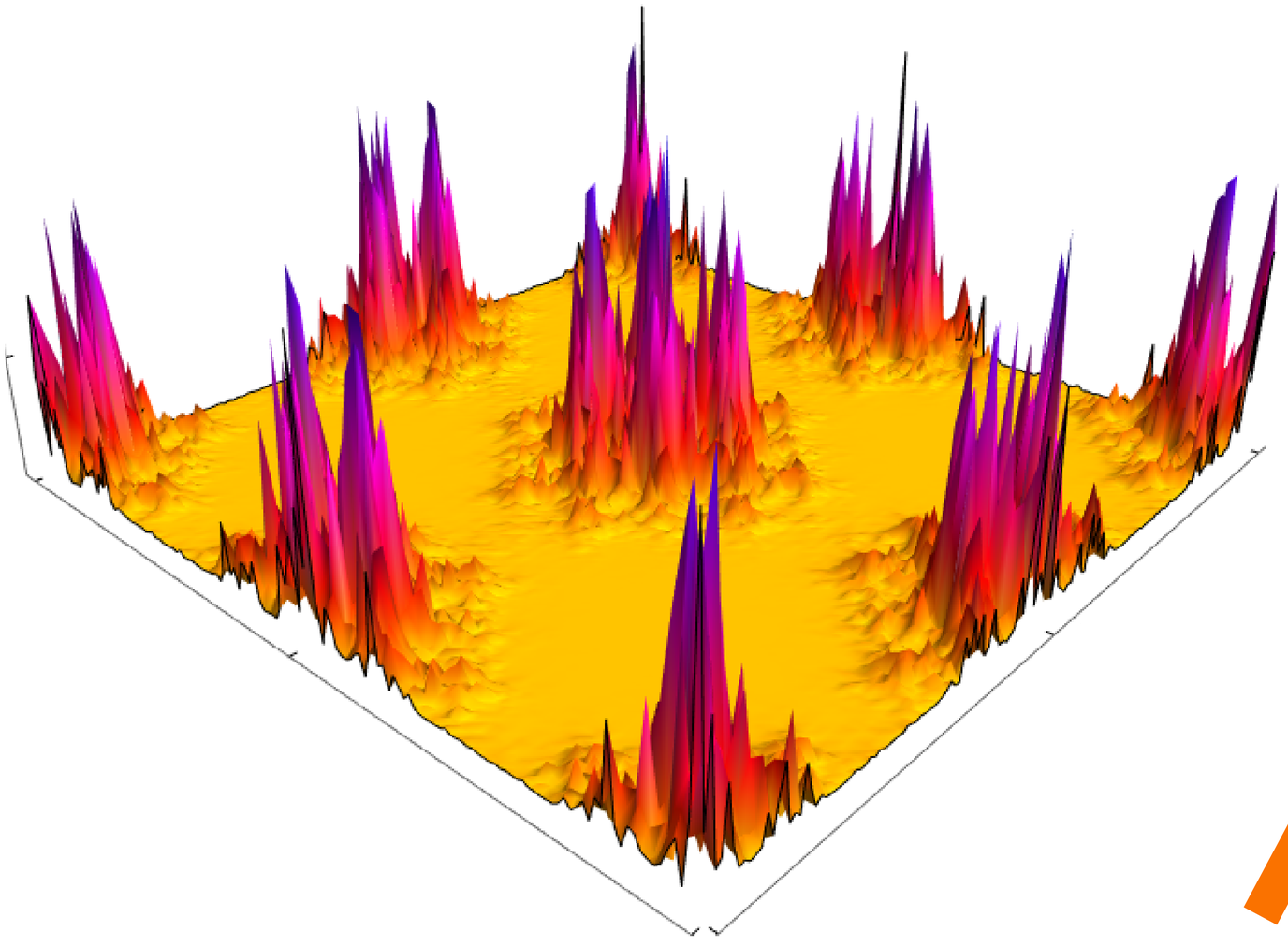


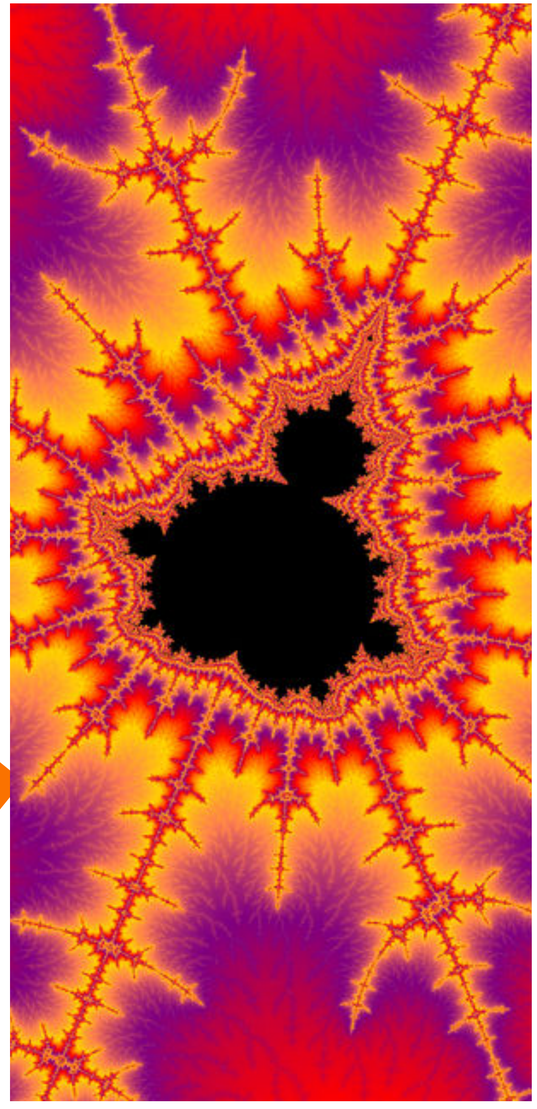
probabilities for quantum particles in…



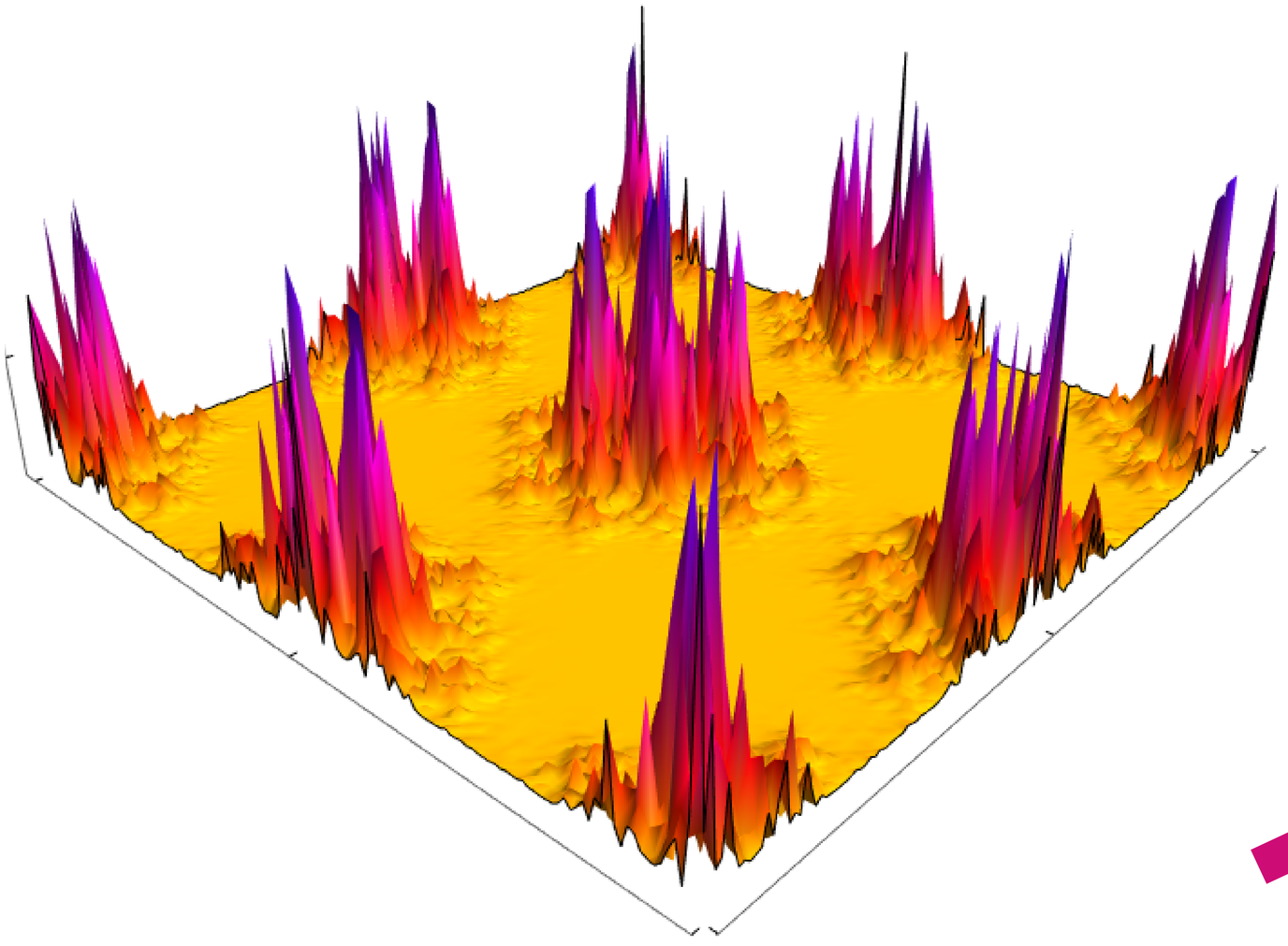


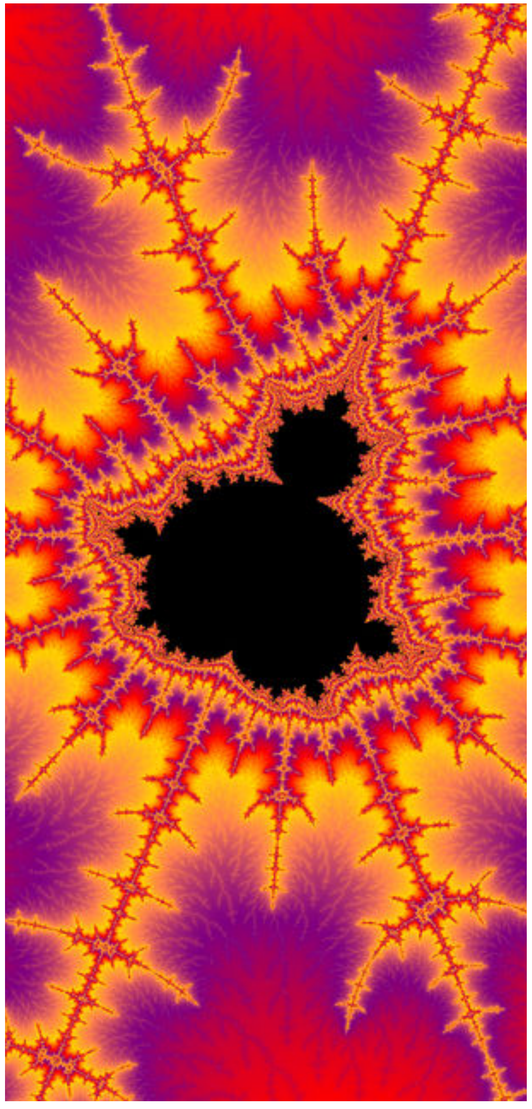
Coastlines of dimension 1.25



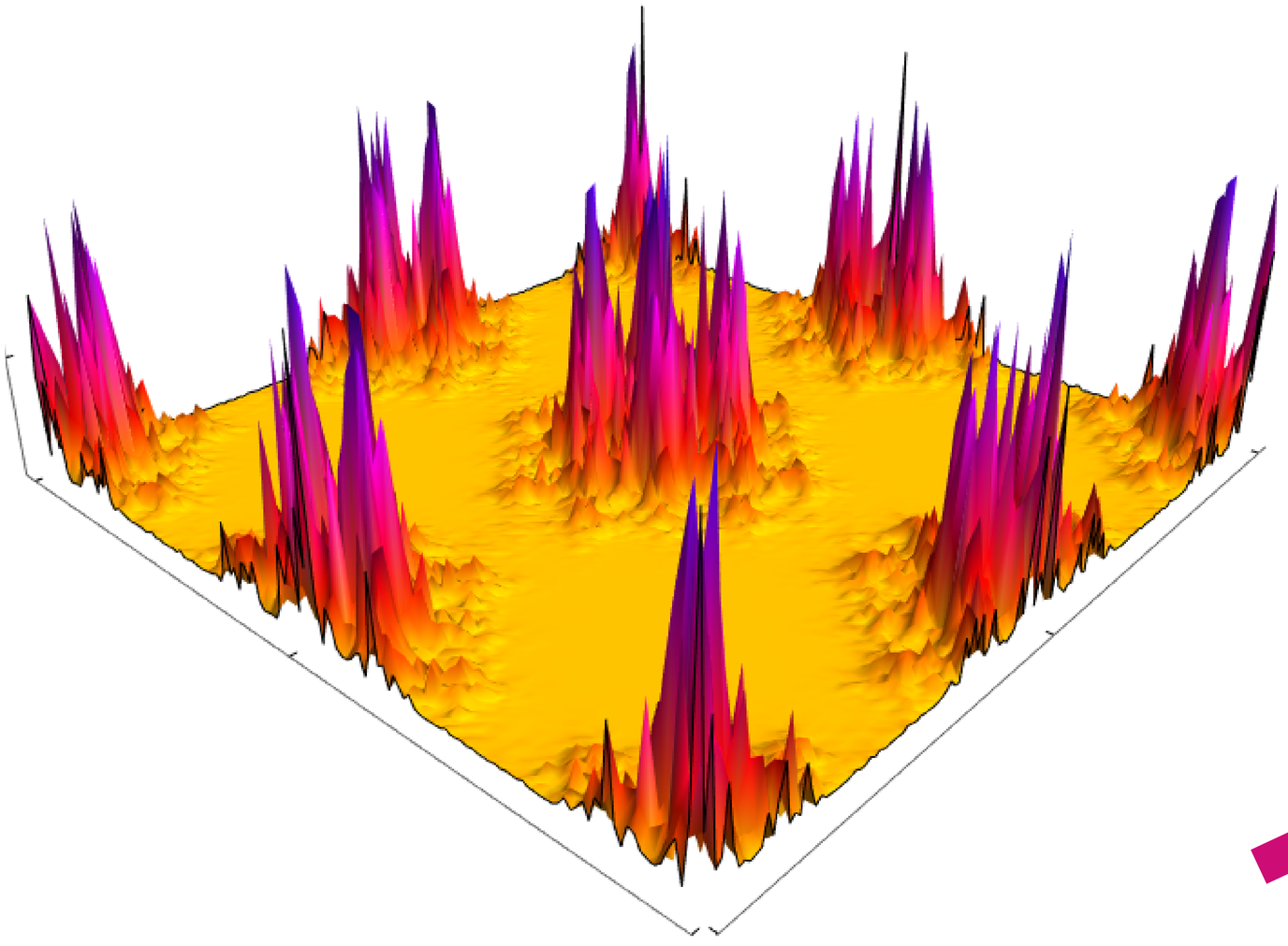


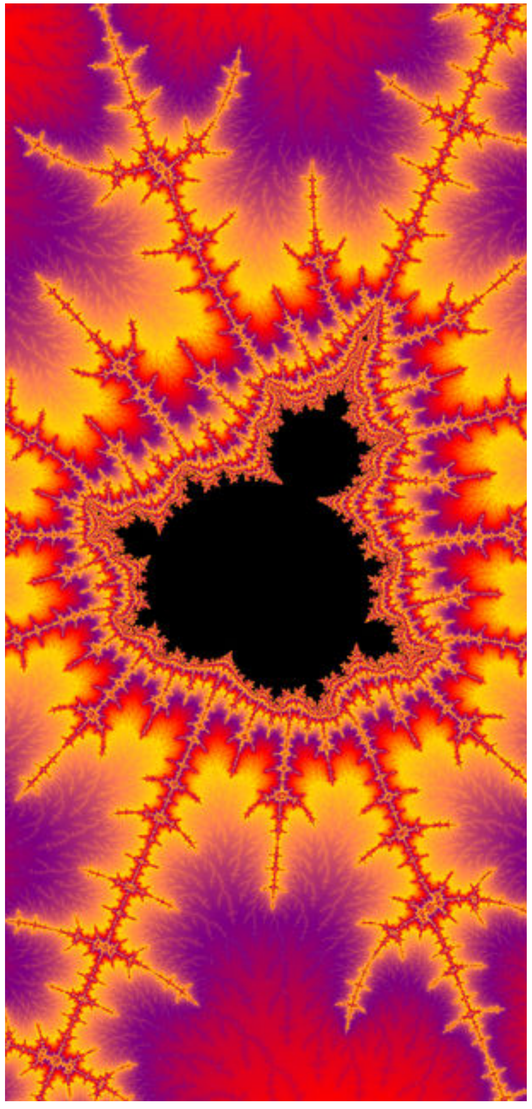
Coastlines of dimension 1.25





Coastlines of dimension 1.25





Conclusion:

from
the perspective of quantum physics
equal temperament isn’t all that boring

Elio König-Tarasevich