Understanding Graphs

(For HKDSE Math Core Students)

– an atlas for functions and their graphs

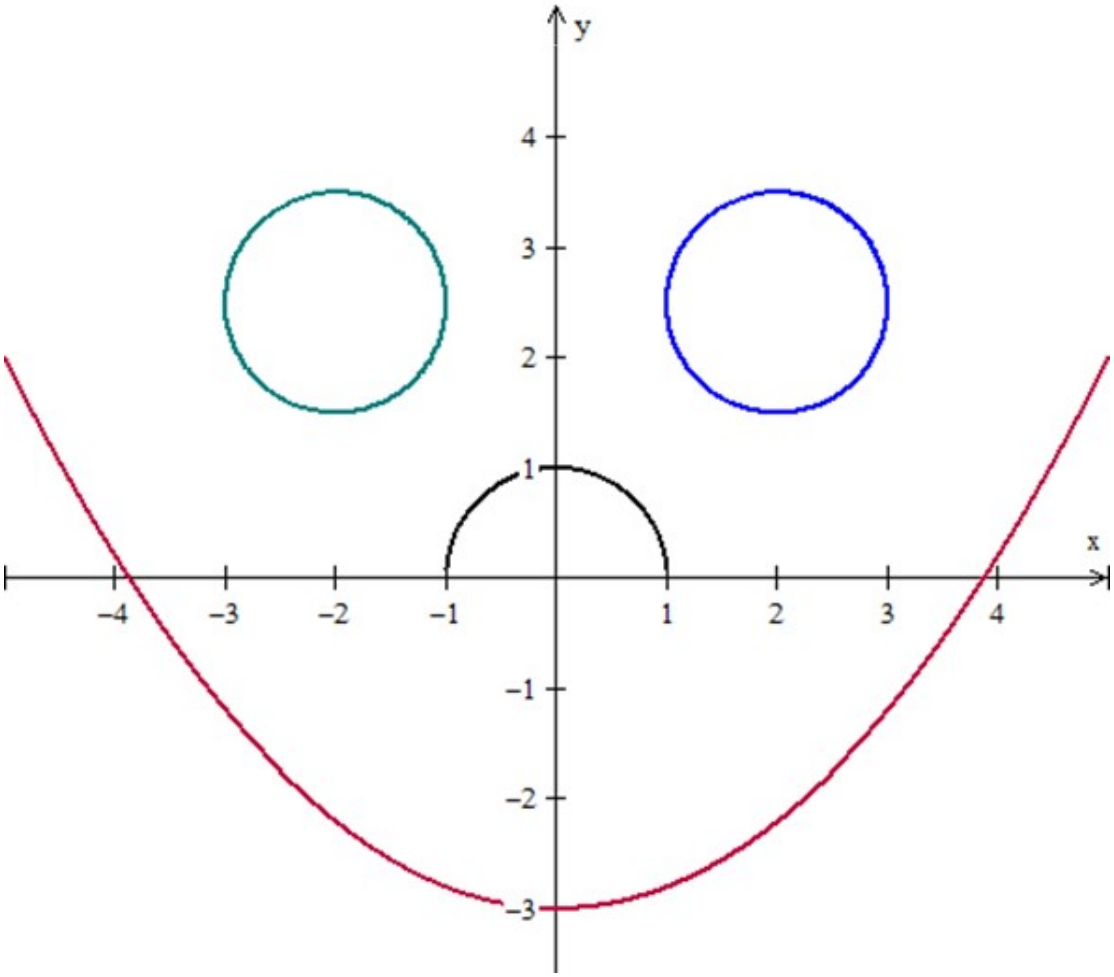
$$y = 0.2\,x^2 - 3$$

$$x = \cos t + 2\,;\, 0 < t < \pi$$

$$y = \sin t + 2.5\,;\, 0 < t < \pi$$

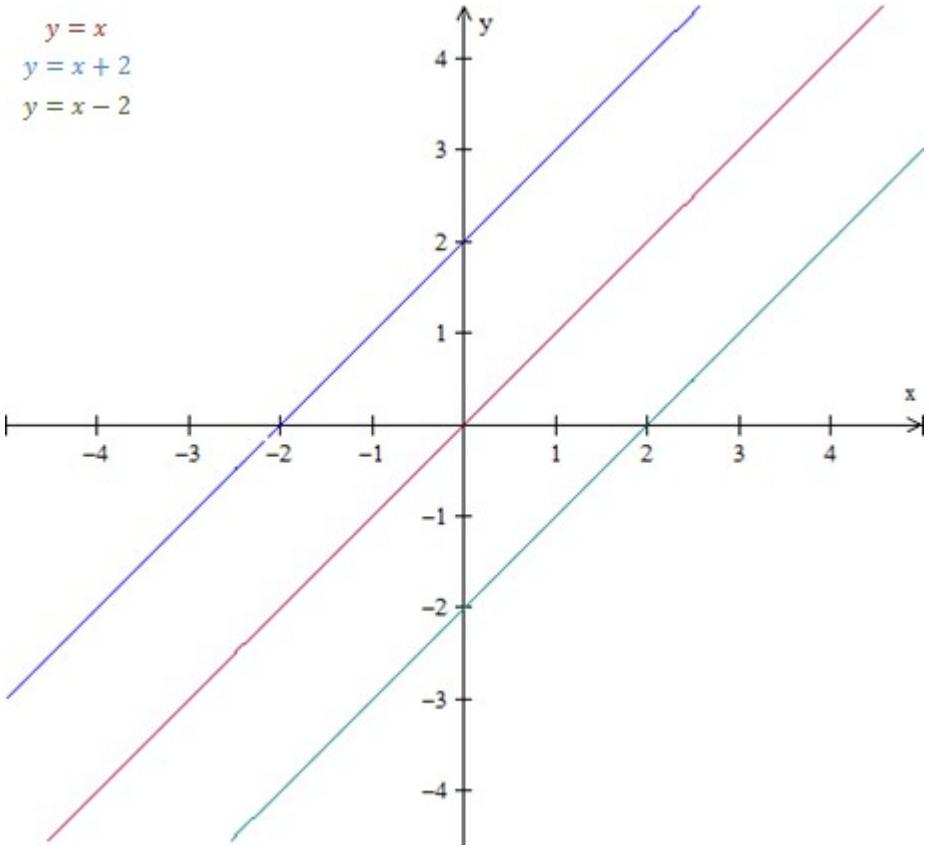
$$(x+2)^2 + (y-2.5)^2 = 1$$

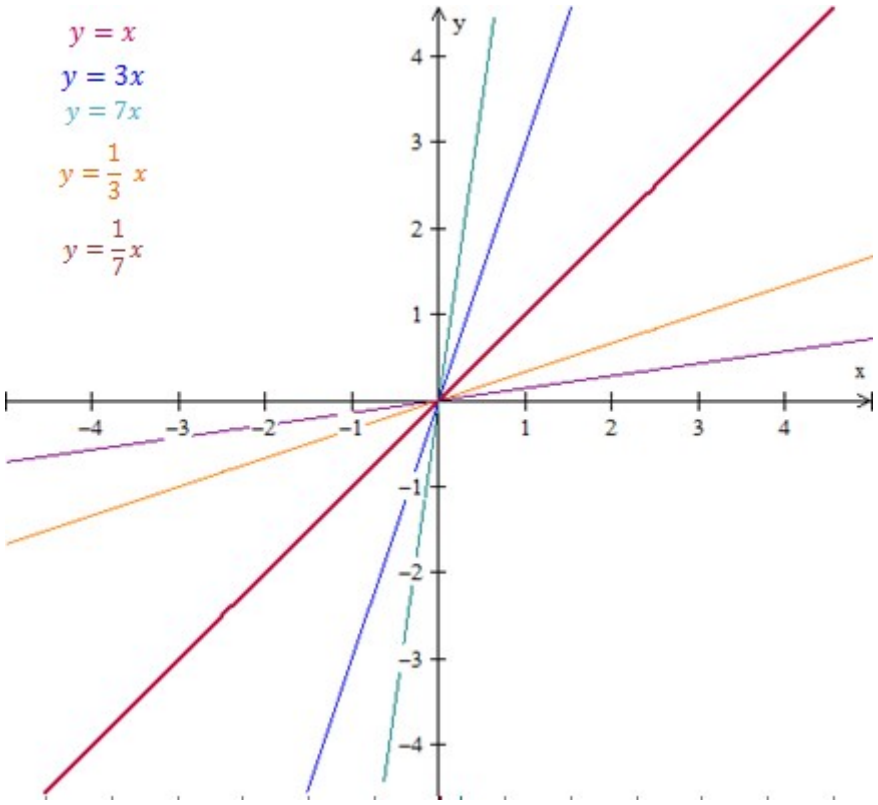
$$y = \sqrt{1 - x^2}$$

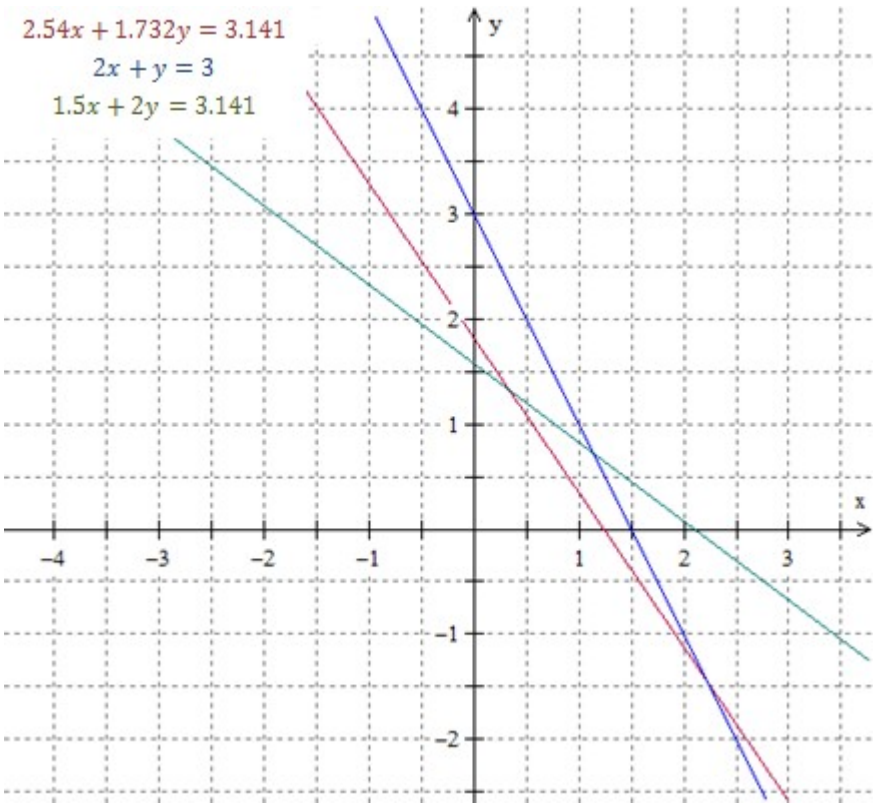


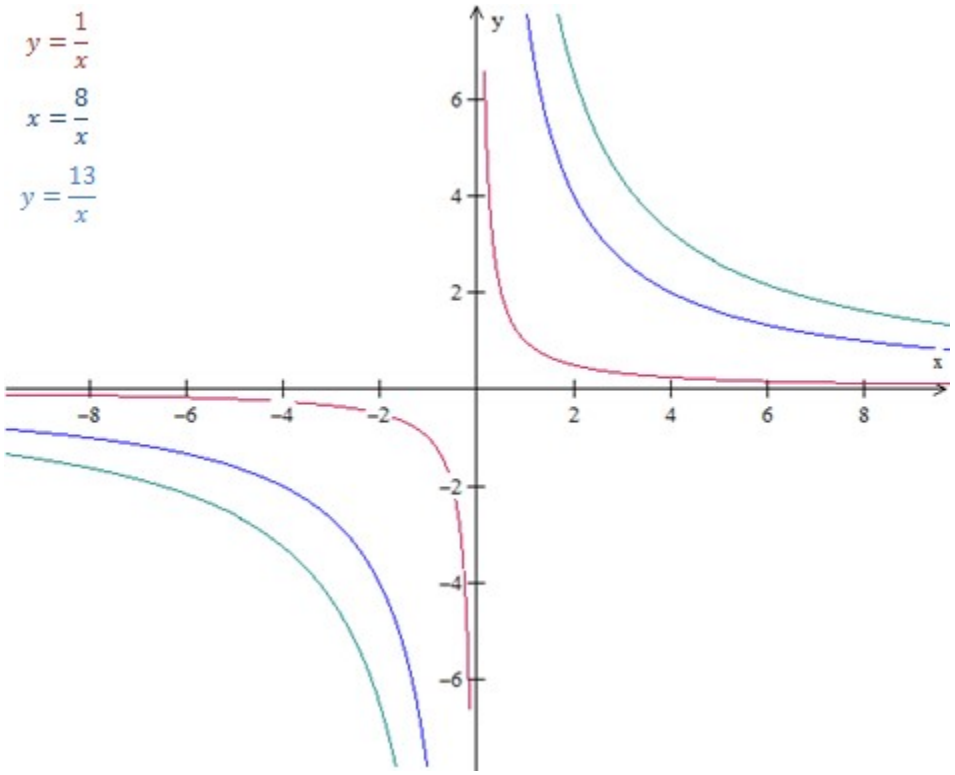
version 1.21

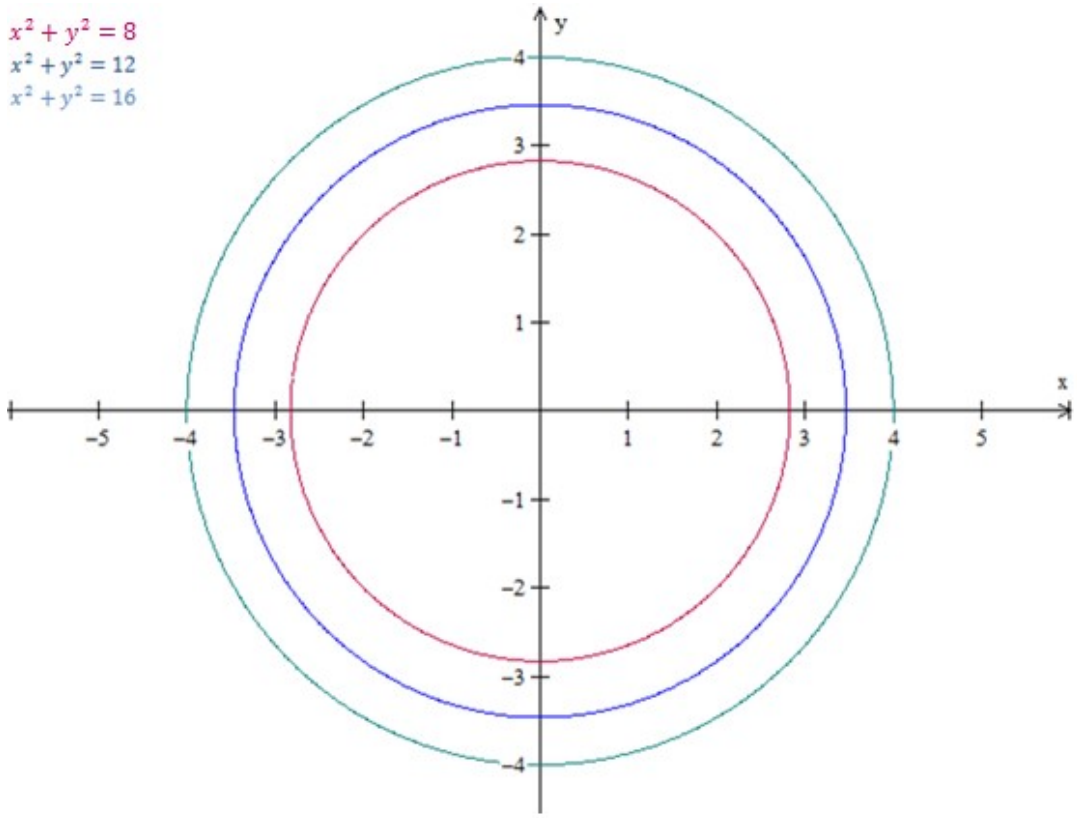
3rd Oct 2017

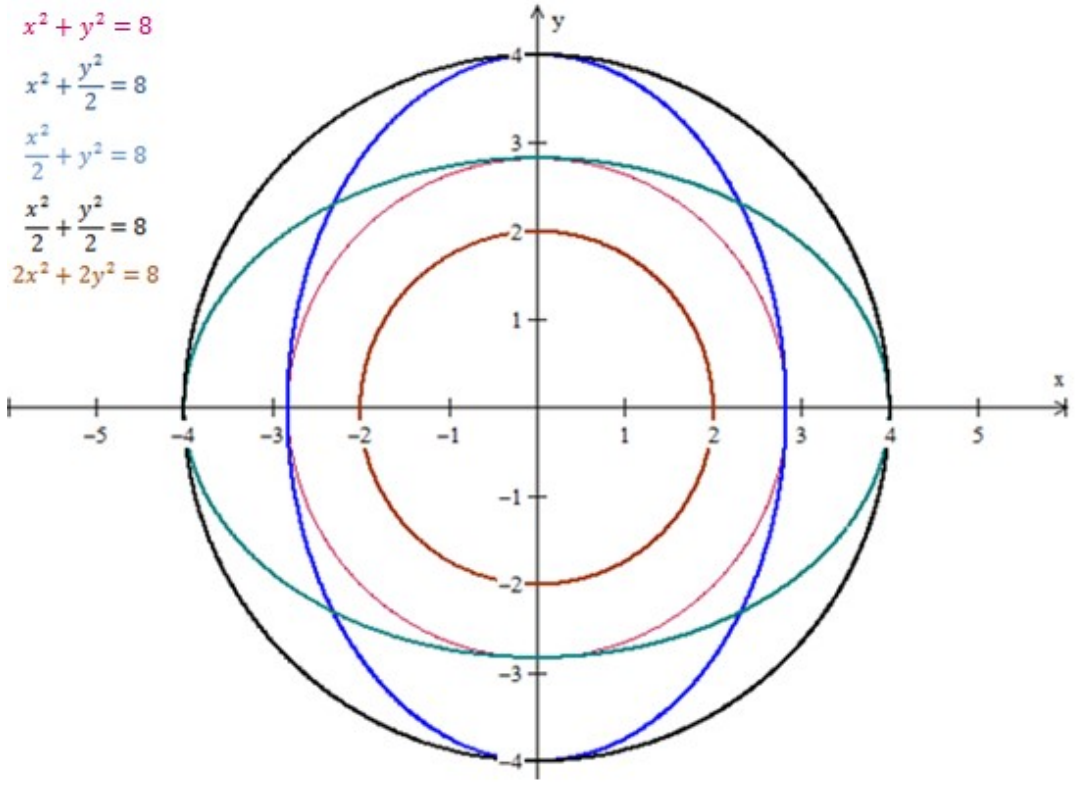

y = x
y = x + 2
y = x − 2
y
x
4
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4

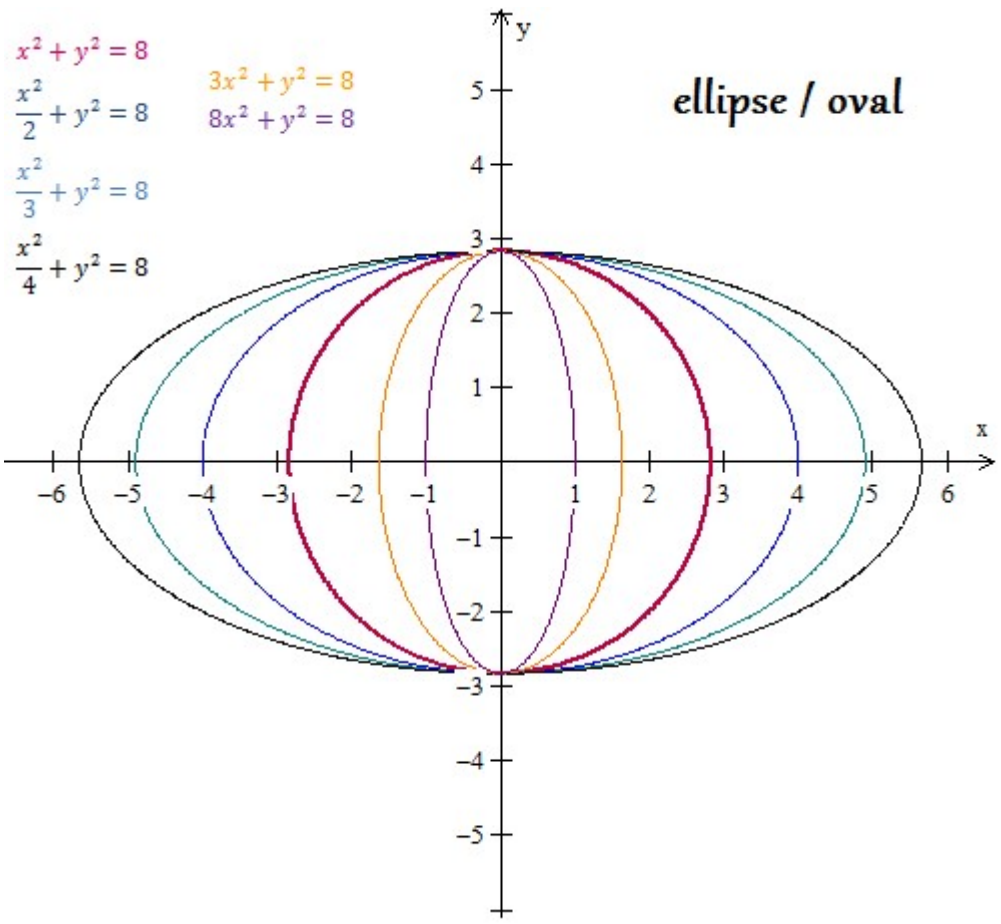

y = x
y = 3x
y = 7x
y = 1/3 x
y = 1/7 x
y
x
4
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4

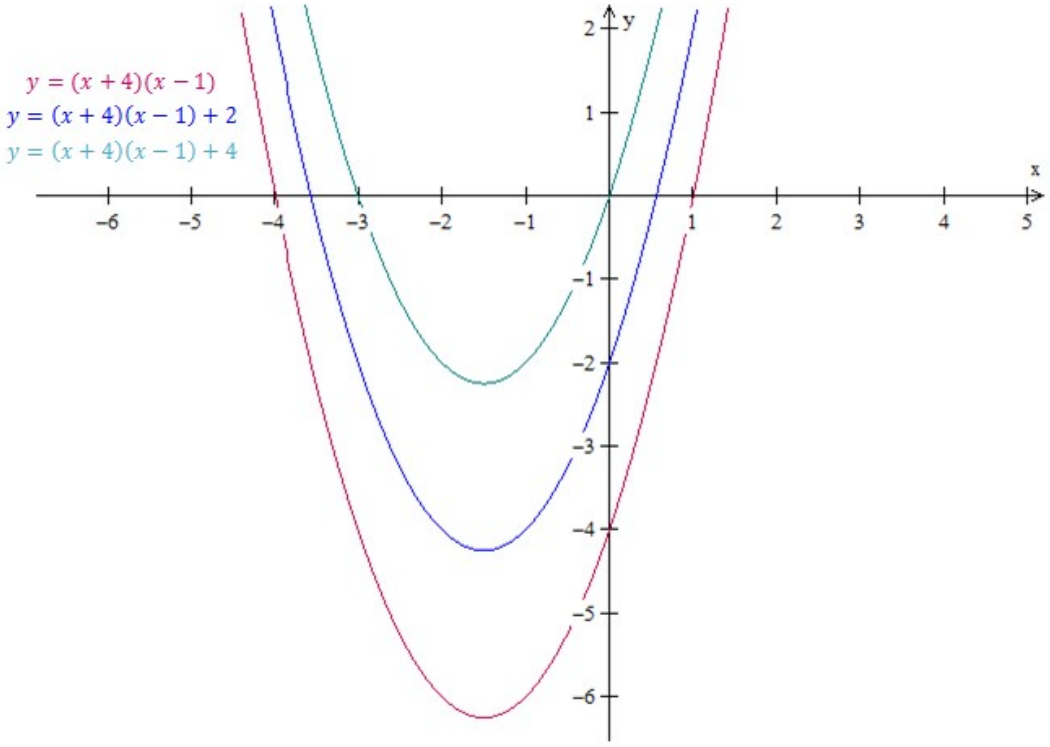

2.54x + 1.732y = 3.141
2x + y = 3
1.5x + 2y = 3.141
y
x
4
3
2
1
−1
−2
−4
−3
−2
−1
1
2
3

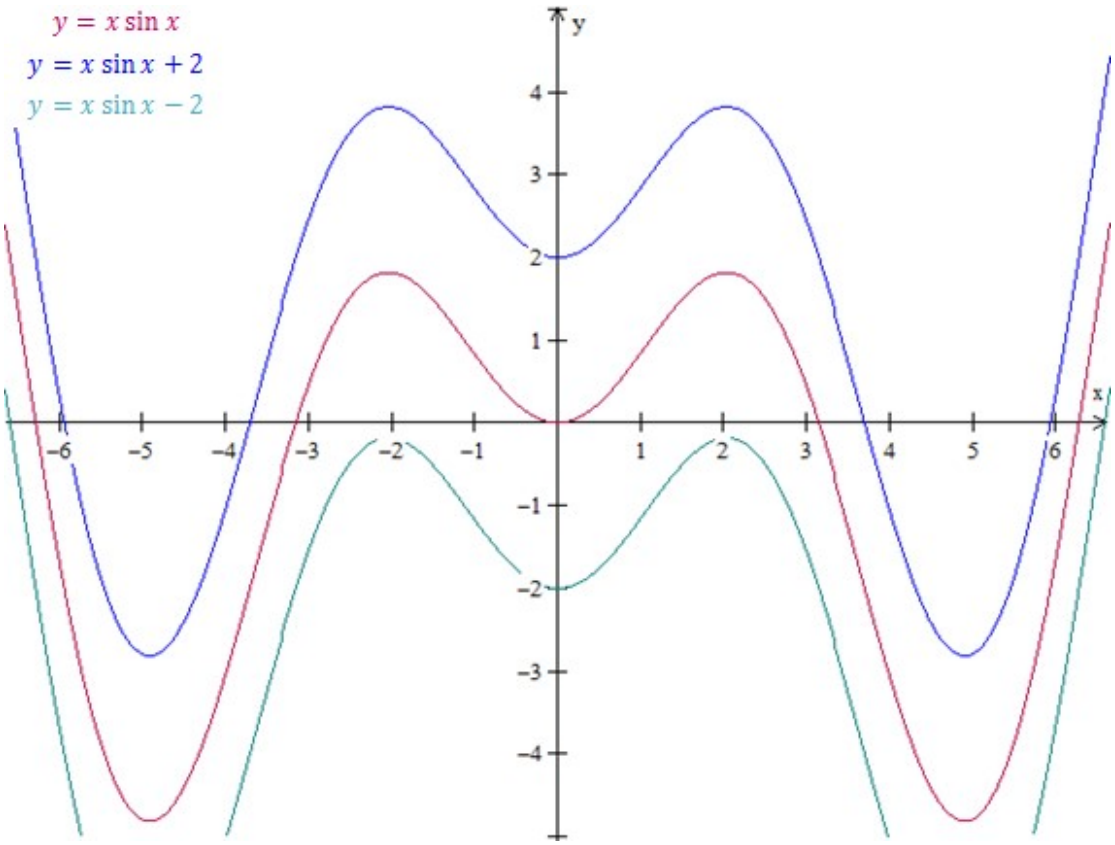

y = 1/x
x = 8/x
y = 13/x
y
x
6
4
2
−2
−4
−6
−8
−6
−4
−2
2
4
6
8

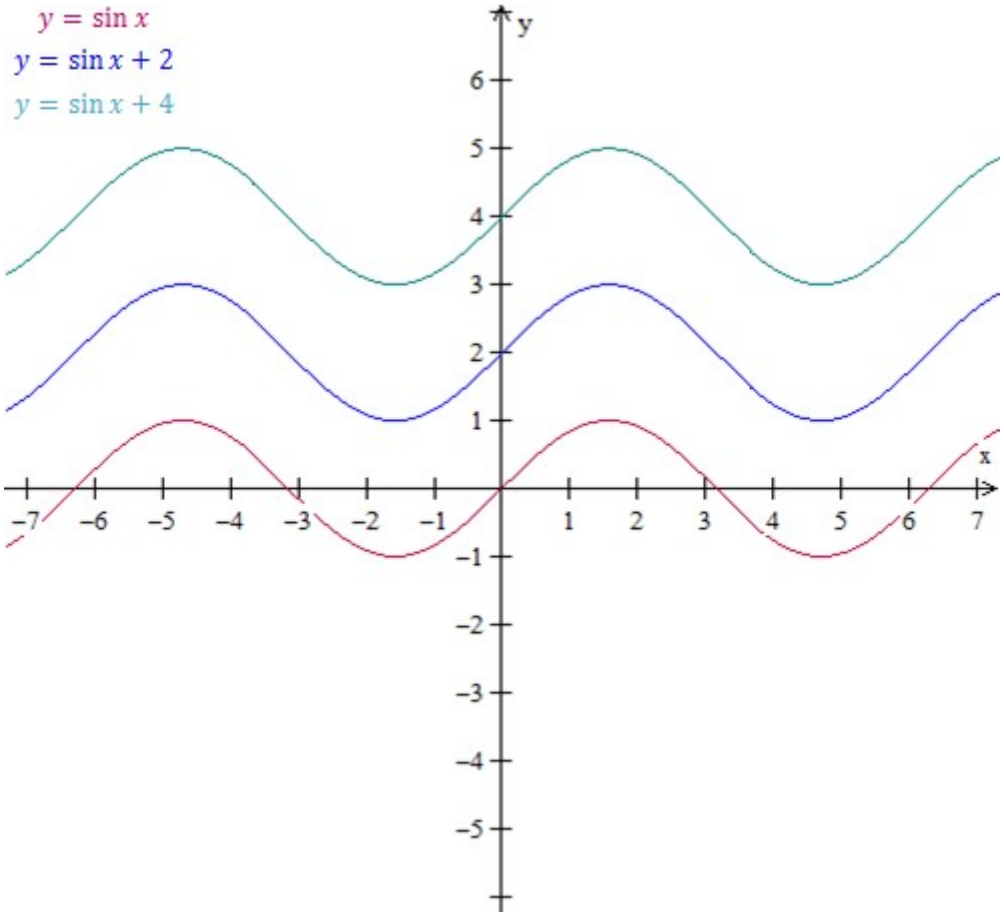

$x^2 + y^2 = 8$
$x^2 + y^2 = 12$
$x^2 + y^2 = 16$
y
x

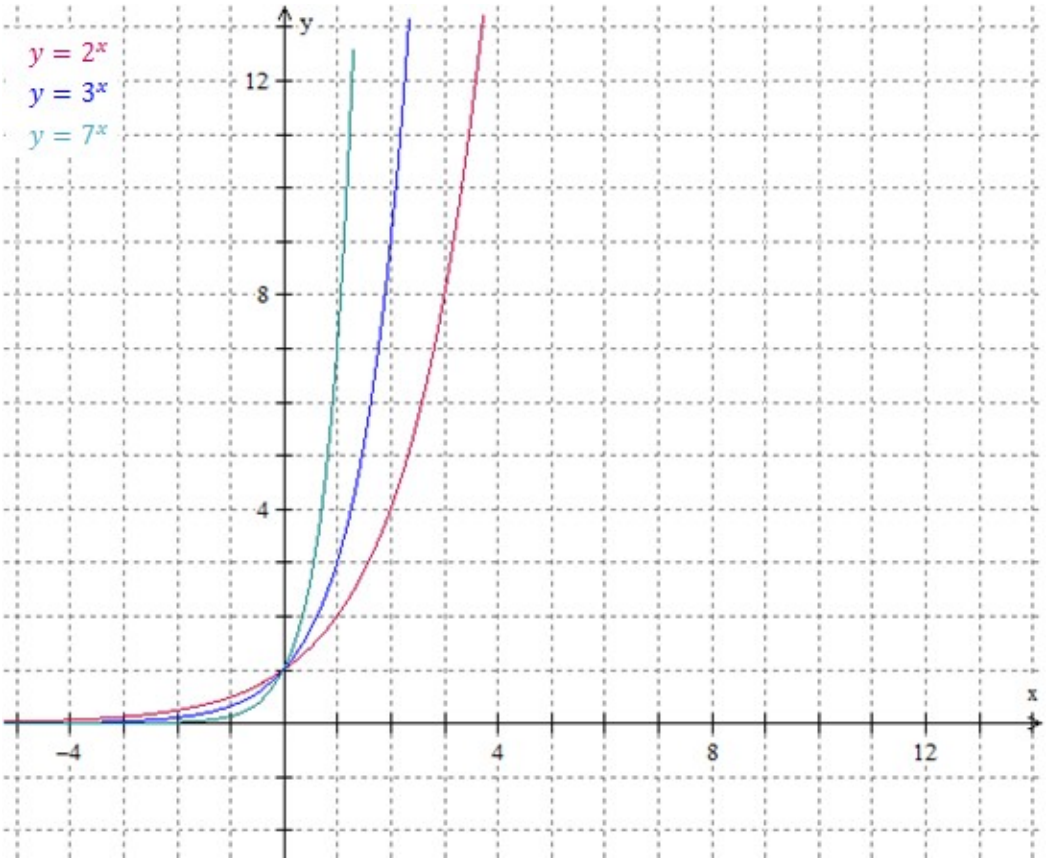

$x^2 + y^2 = 8$
$x^2 + \frac{y^2}{2} = 8$
$\frac{x^2}{2} + y^2 = 8$
$\frac{x^2}{2} + \frac{y^2}{2} = 8$
$2x^2 + 2y^2 = 8$
y
x

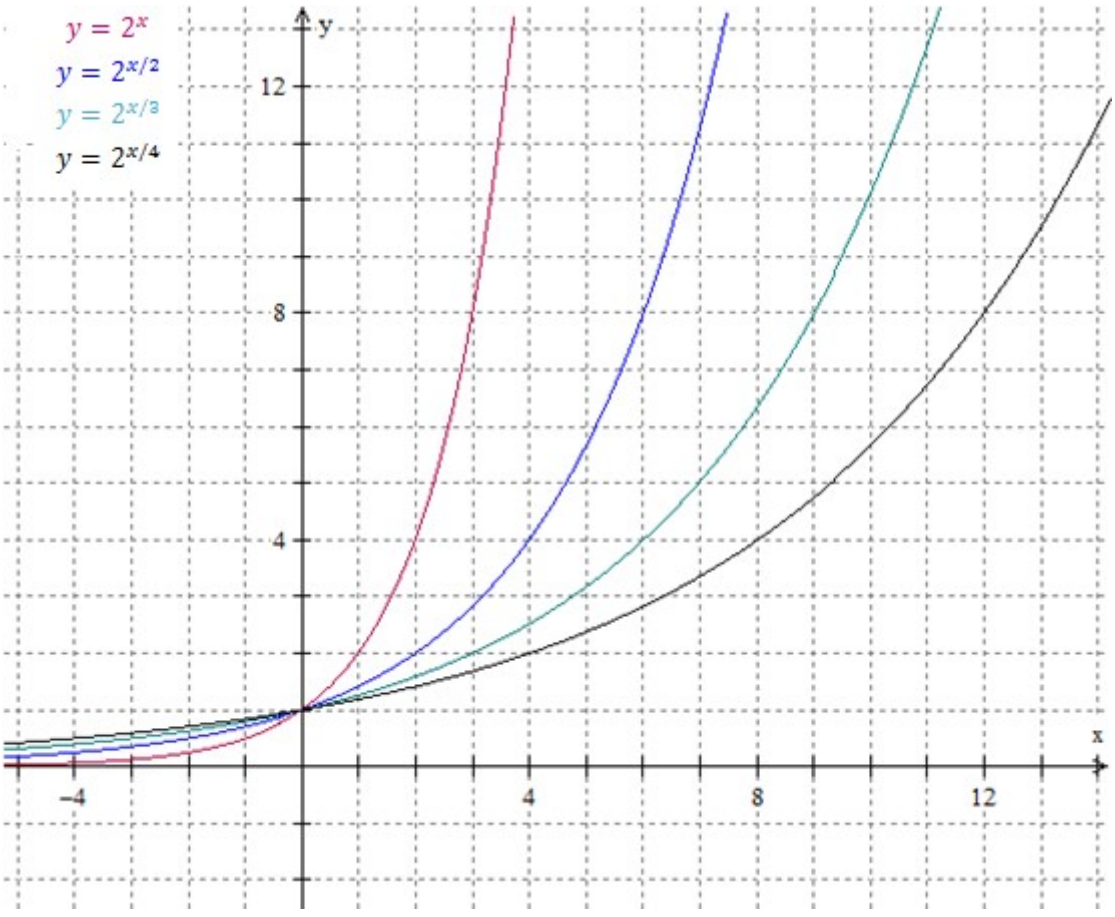

$x^2 + y^2 = 8$
$\frac{x^2}{2} + y^2 = 8$
$\frac{x^2}{3} + y^2 = 8$
$\frac{x^2}{4} + y^2 = 8$
$3x^2 + y^2 = 8$
$8x^2 + y^2 = 8$
ellipse / oval
x
y


$y = (x + 4)(x - 1)$
$y = (x + 4)(x - 1) + 2$
$y = (x + 4)(x - 1) + 4$
x
y

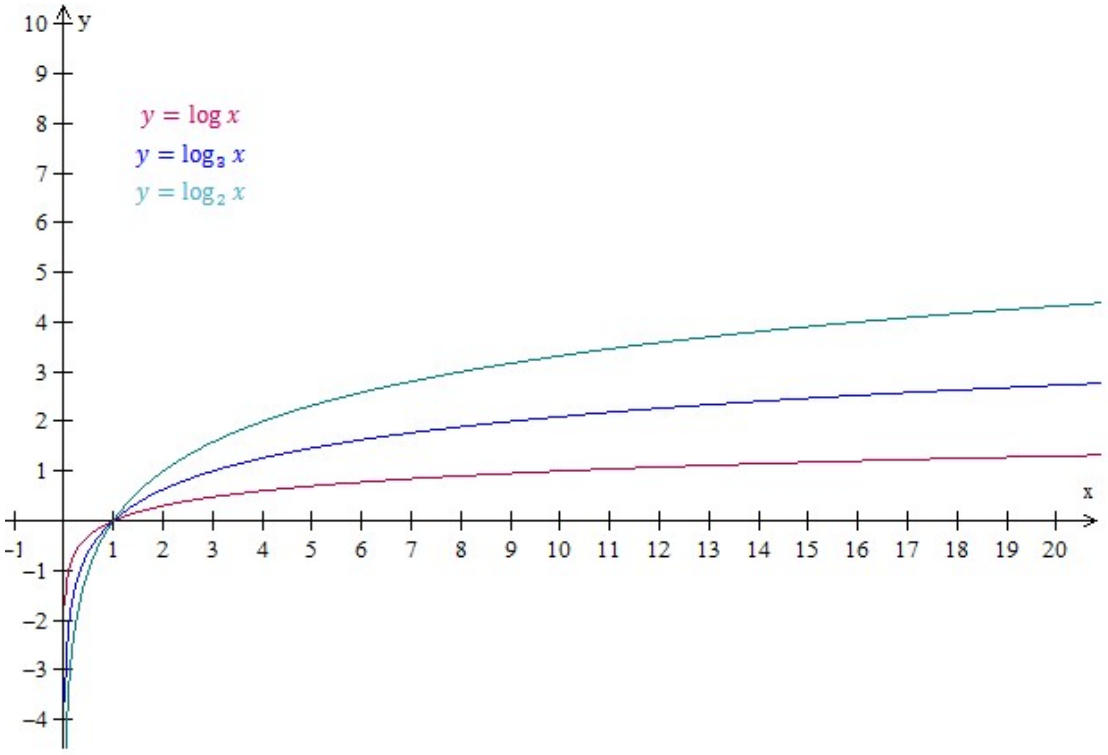

$y = x \sin x$
$y = x \sin x + 2$
$y = x \sin x - 2$
y
x
4
3
2
1
−1
−2
−3
−4
−6
−5
−4
−3
−2
−1
1
2
3
4
5
6

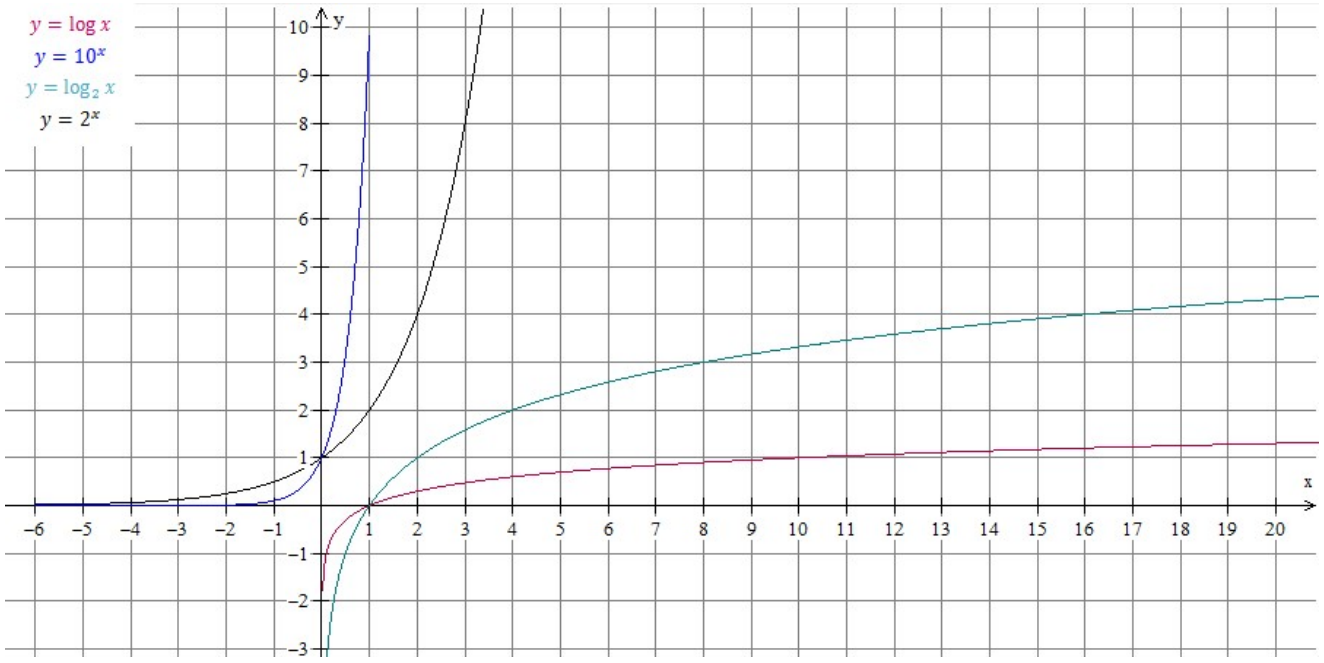

$y = \sin x$
$y = \sin x + 2$
$y = \sin x + 4$
y
x
6
5
4
3
2
1
−1
−2
−3
−4
−5
−7
−6
−5
−4
−3
−2
−1
1
2
3
4
5
6
7

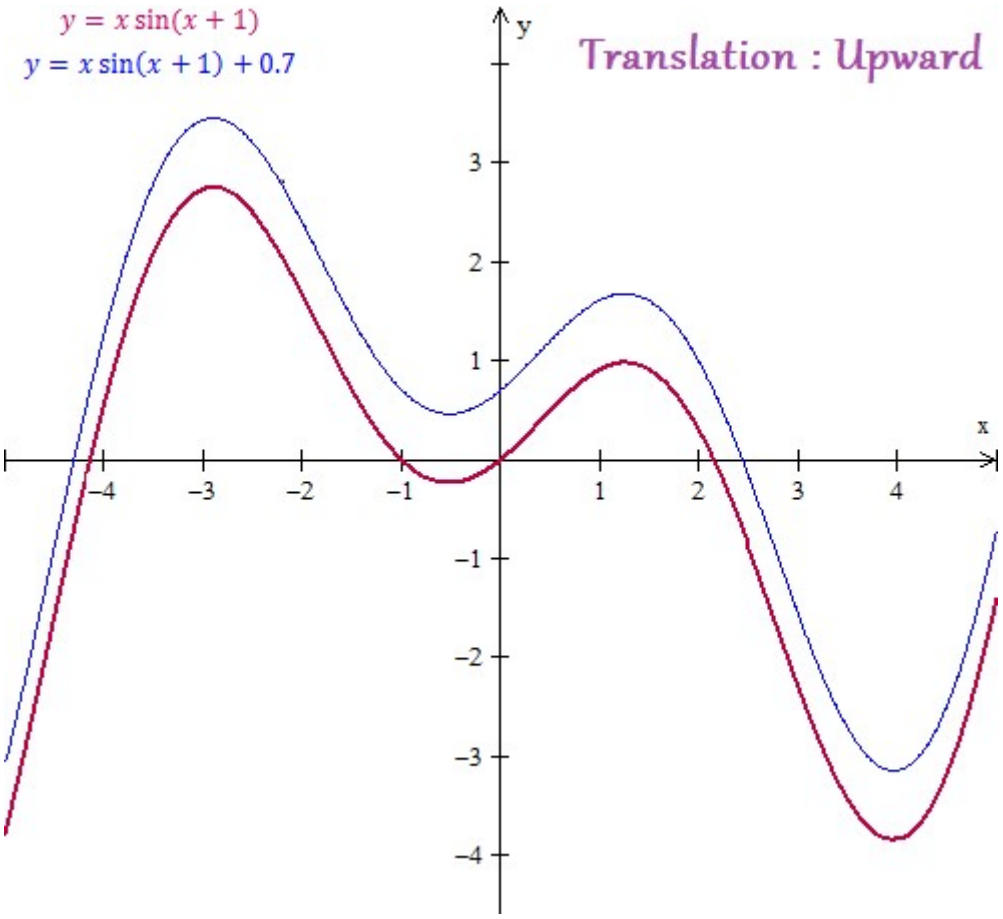

y = 2^x
y = 3^x
y = 7^x
y
x
12
8
4
−4
4
8
12

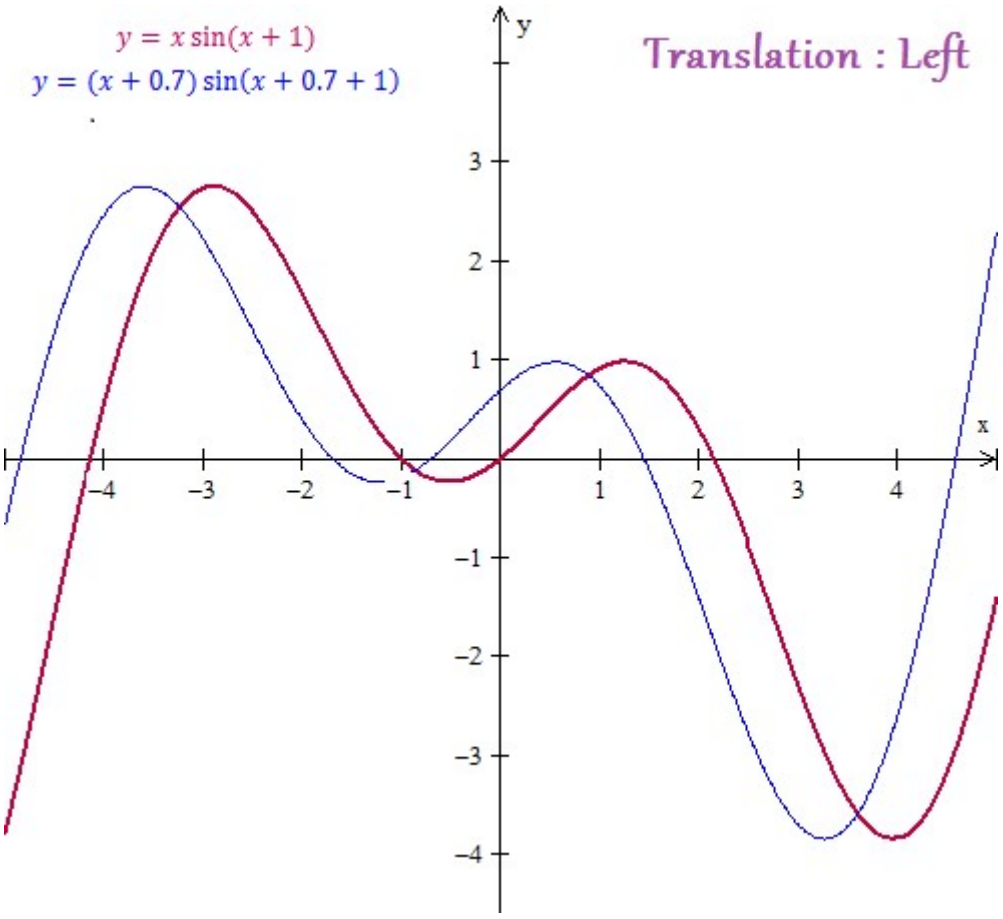

y = 2^x
y = 2^(x/2)
y = 2^(x/3)
y = 2^(x/4)
y
x
12
8
4
−4
4
8
12

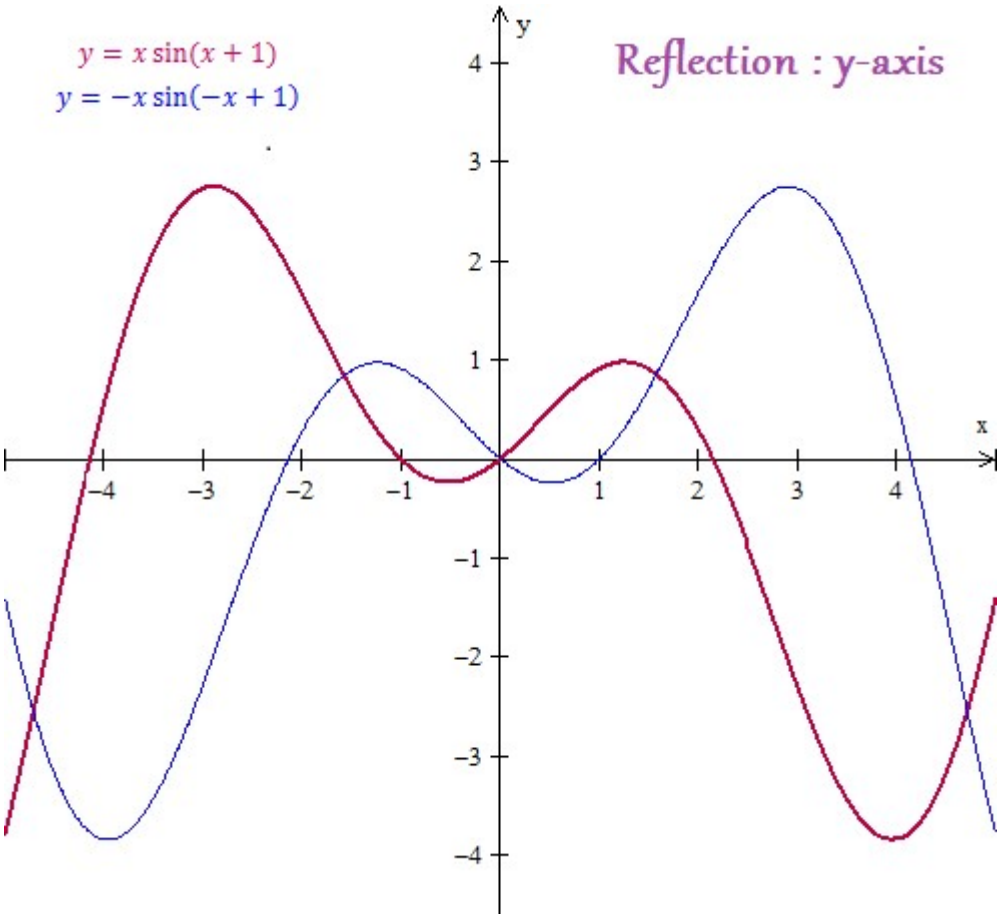
Exponential & Logarithm

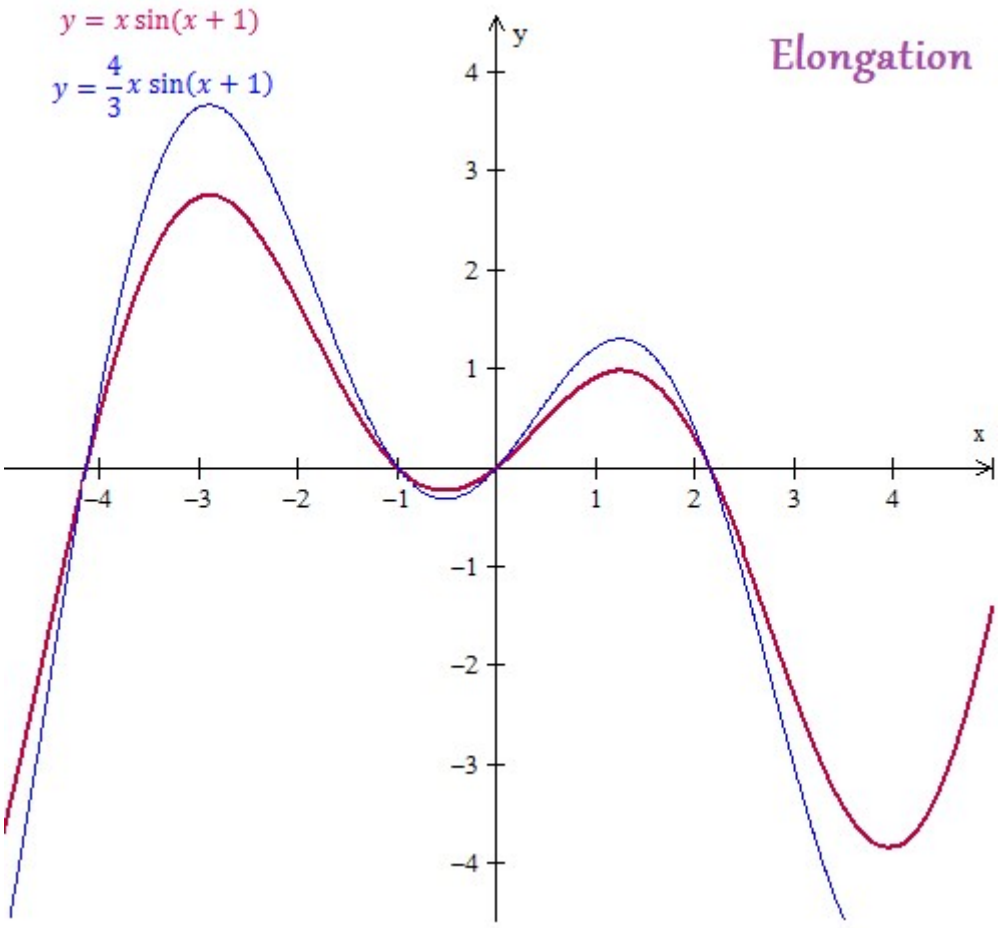




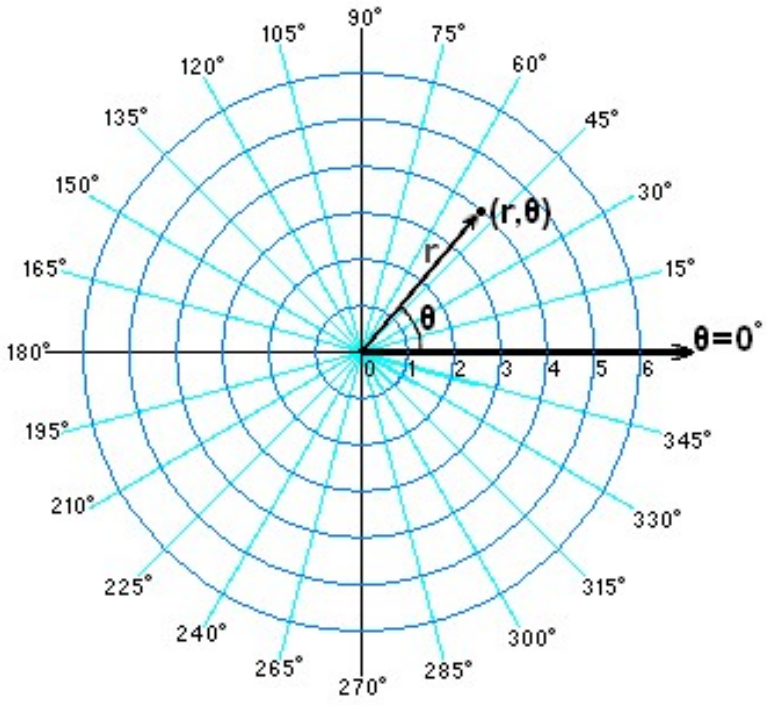

$y = x\sin(x+1)$
$y = x\sin(x+1) + 0.7$
Translation : Upward
y
x
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4

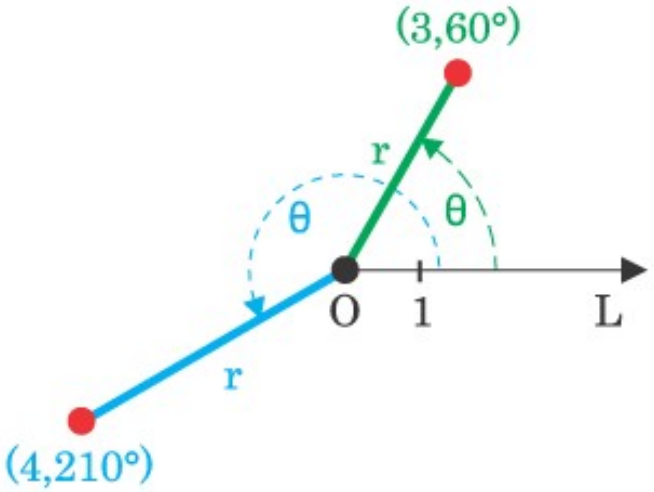

$y = x\sin(x+1)$
$y = (x+0.7)\sin(x+0.7+1)$
Translation : Left
y
x
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4


$y = x\sin(x+1)$
$y = -x\sin(-x+1)$
Reflection : y-axis
y
x
4
3
2
1
−1
−2
−3
−4
−4
−3
−2
−1
1
2
3
4



Polar Coordinates




(3,60°)
r
θ
θ
O
1
L
r
(4,210°)

Understanding Graphs (For HKDSE Math Core Students) – version 1.21
-- an atlas for functions and their graphs

Graphs mainly plotted by *Winplot* (made by Richard Parris)

Pictures for the polar coordinates are from Wikipedia, explicitly, these pages:
https://zh.wikipedia.org/wiki/File:CircularCoordinates.png
https://commons.wikimedia.org/wiki/File:Point_in_Polar_coordinates.PNG

Geography students have their atlases. I want to write "atlases" to help people (especially high school students) to facilitate their study on Math too.

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