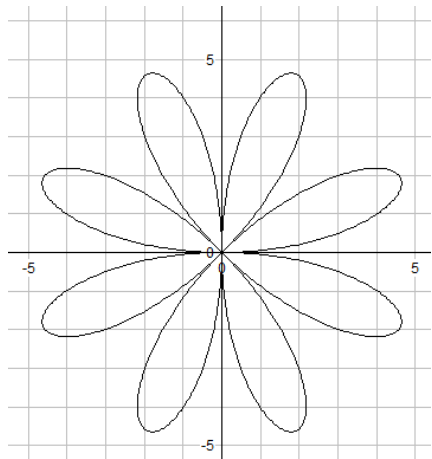


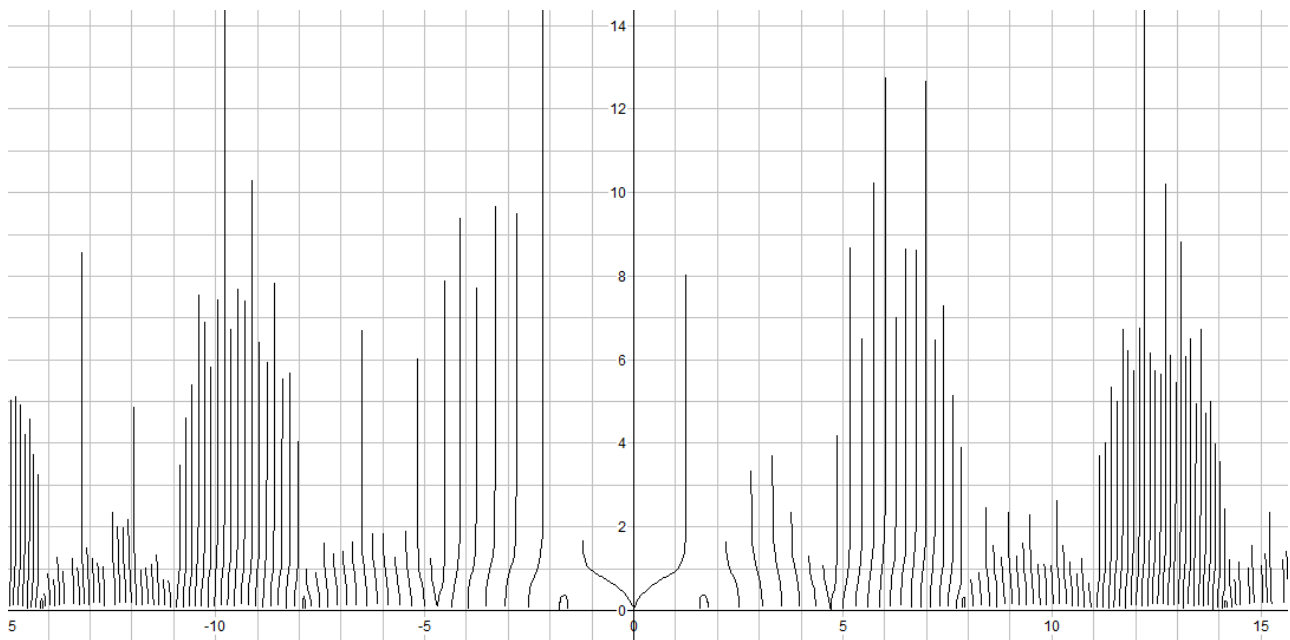
A Picture is Worth A Thousand Exercises

Colin Foster



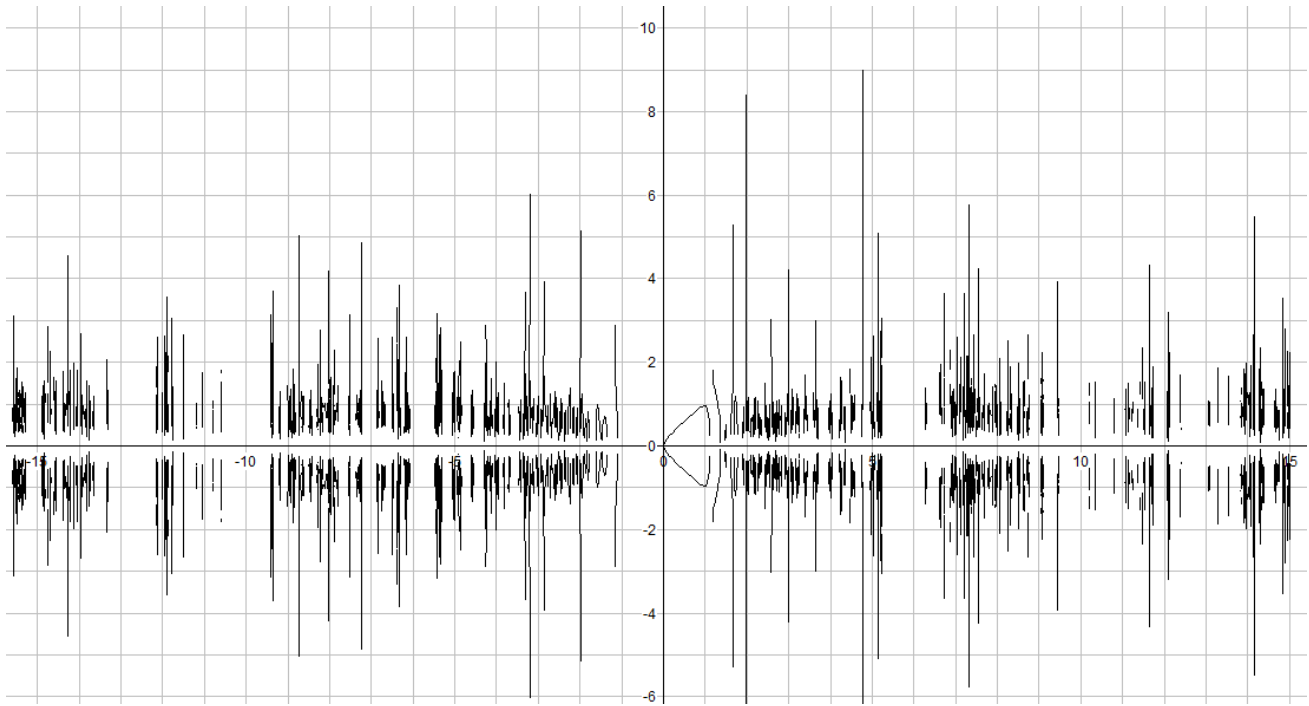
Flower

$$r = 10 \cos 2\theta \sin 2\theta \text{ for 1 rev}$$



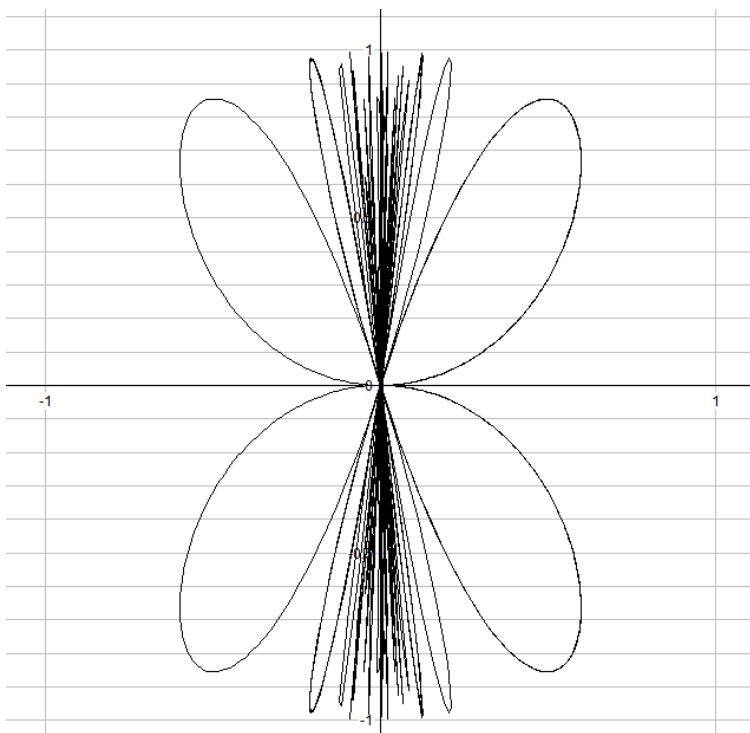
Forest

$$y = (\tan x^2 \cos x)^{0.3}$$



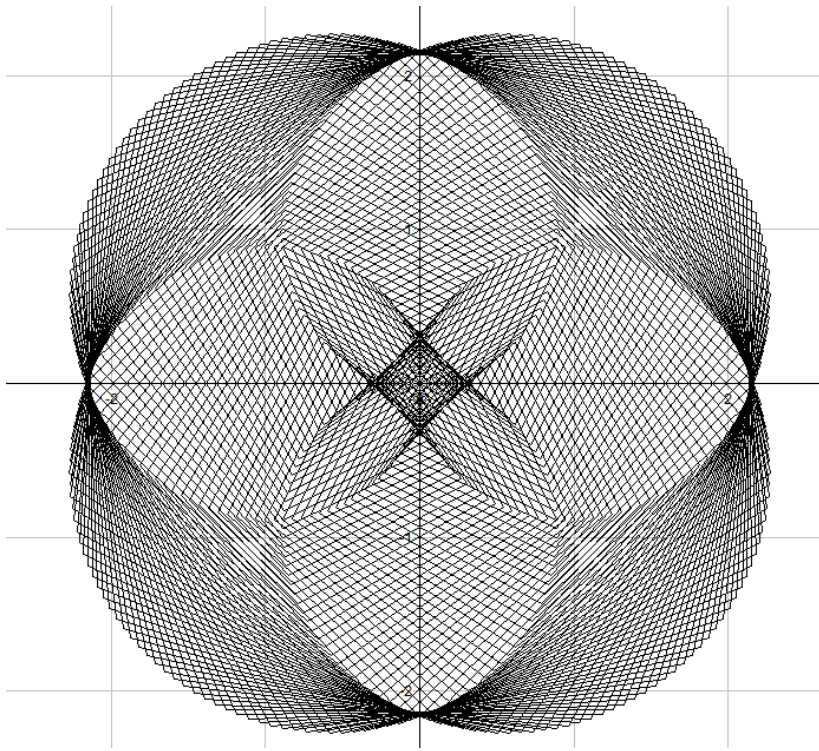
A calm still lake

$$y^4 = \tan x^3 \cos x^5$$



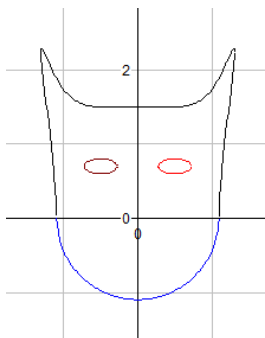
Butterfly

$$r = \sin(\tan \theta) \text{ for } 1.5 \text{ revs}$$



An insect's eye

$$r = 5 \cos \frac{\theta}{3} \sin \frac{\theta}{3} \text{ for 665 revs}$$



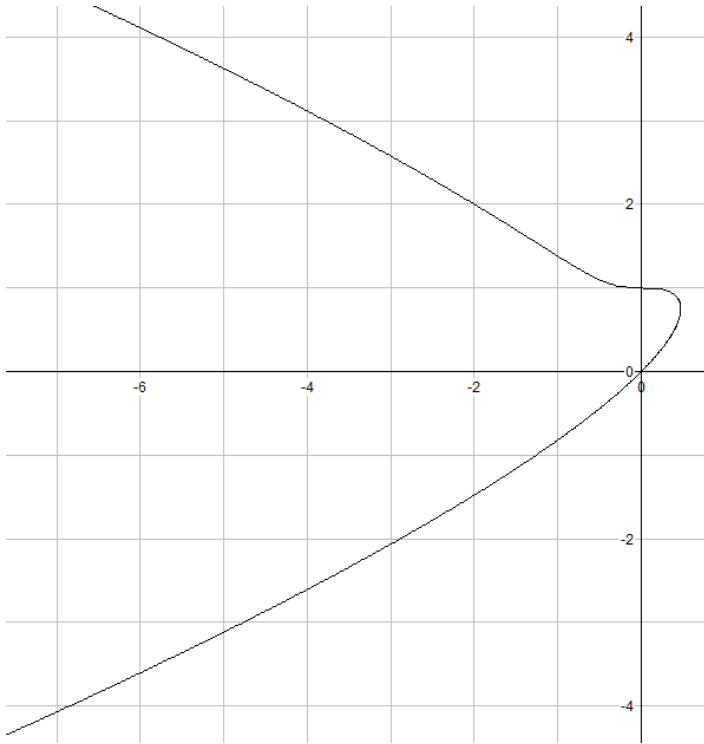
Cat

$$y = \sqrt{x^6 \pm \sqrt{5 - x^6}}$$

$$y = -\sqrt{1.2 - x^2}$$

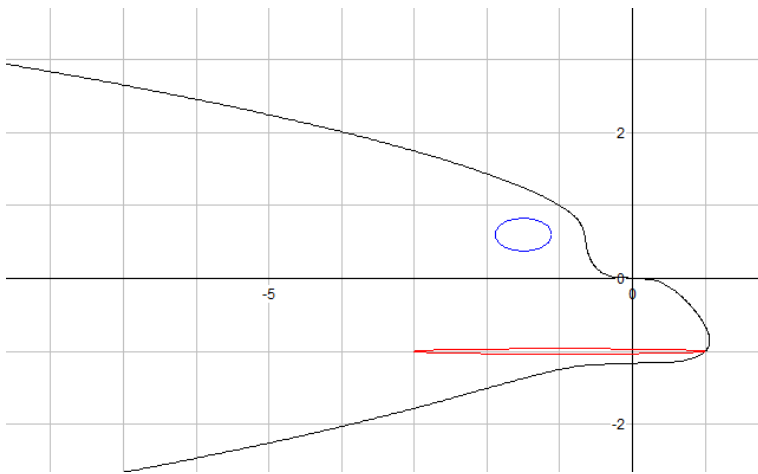
$$(x - 0.5)^2 + 5(y - 0.7)^2 = 0.05$$

$$(x + 0.5)^2 + 5(y - 0.7)^2 = 0.05$$



Beak

$$y^3 = x^3 + y^4$$

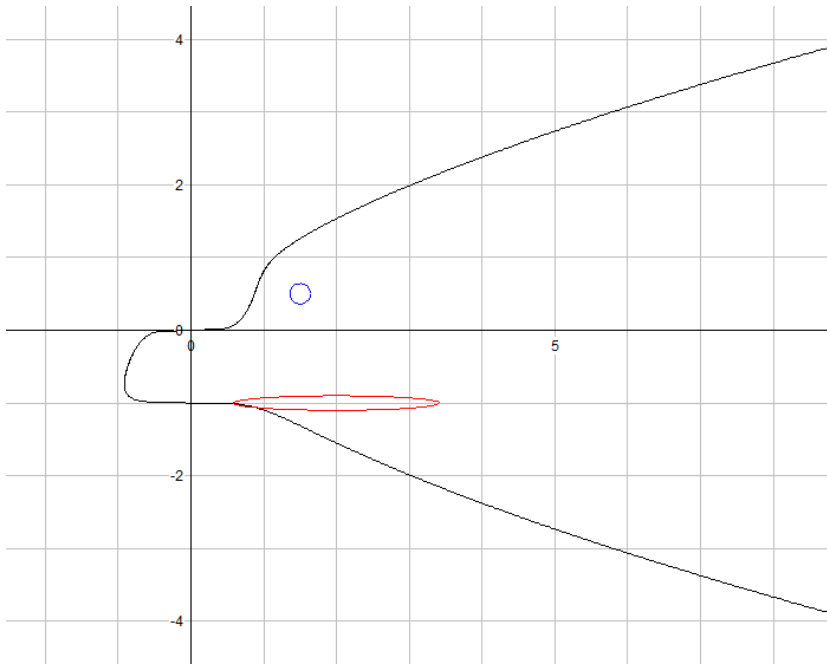


Bird

$$y^2 = y + x^3 + y^6$$

$$(x+1.5)^2 + 3(y-0.6)^2 = 0.15$$

$$(x+1)^2 + 3000(y+1)^2 = 4$$

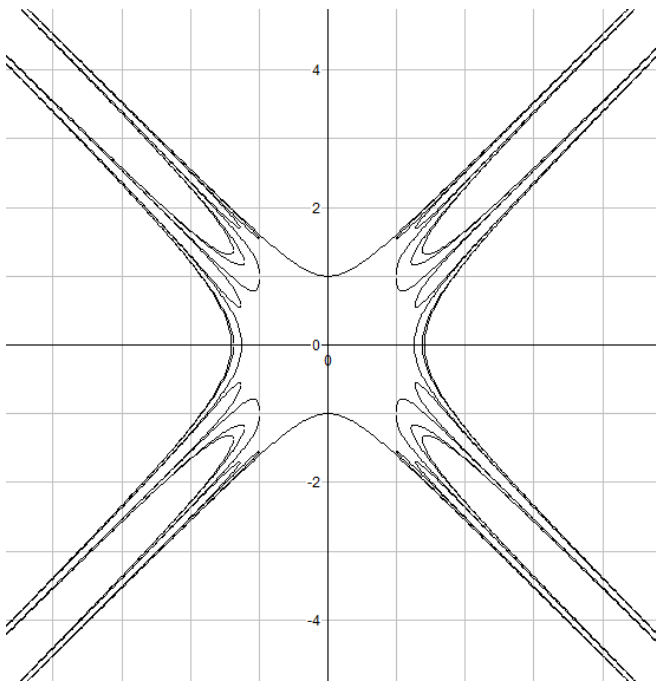


Dolphin

$$y = x^5 - y^8$$

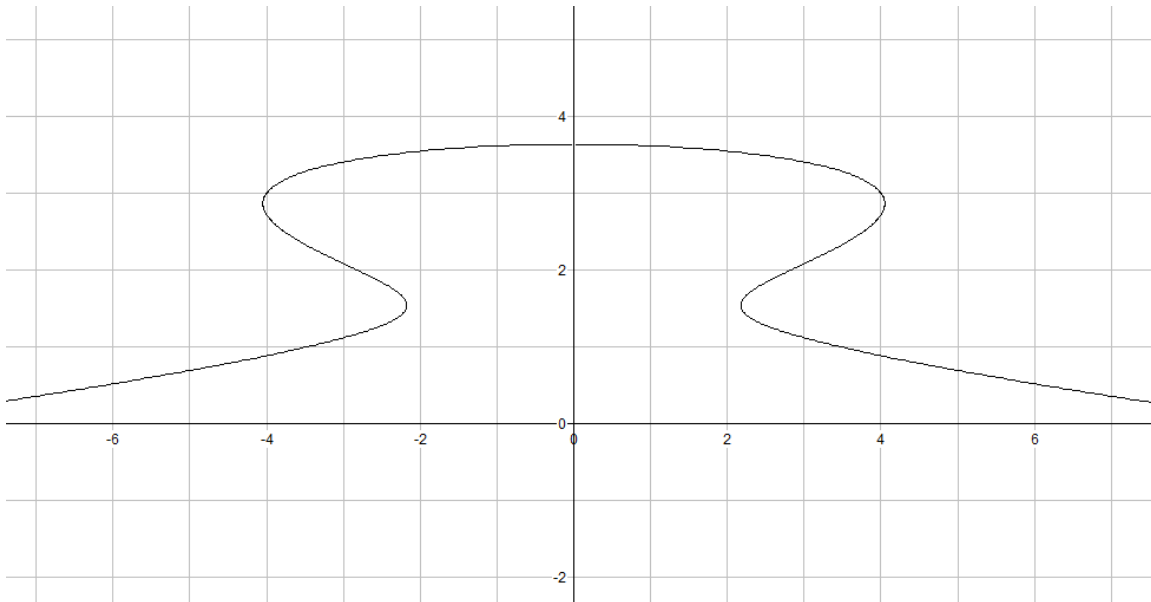
$$(x-1.5)^2 + (y-0.5)^2 = 0.02$$

$$0.005(x-2)^2 + (y+1)^2 = 0.01$$



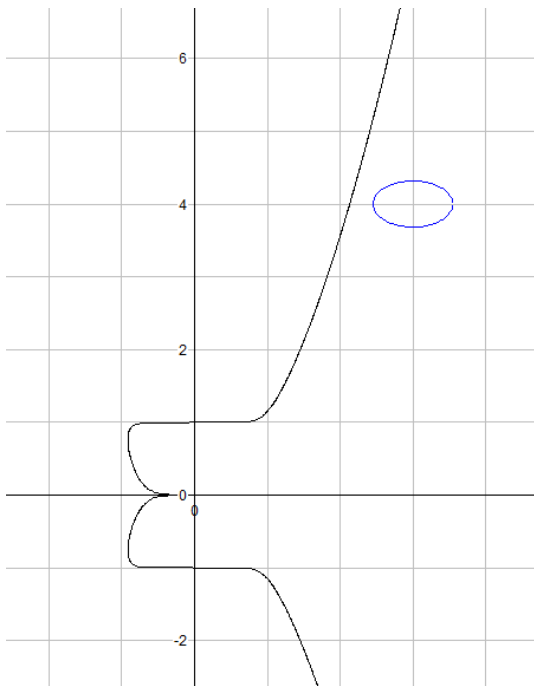
Spiky monster

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



Alien head

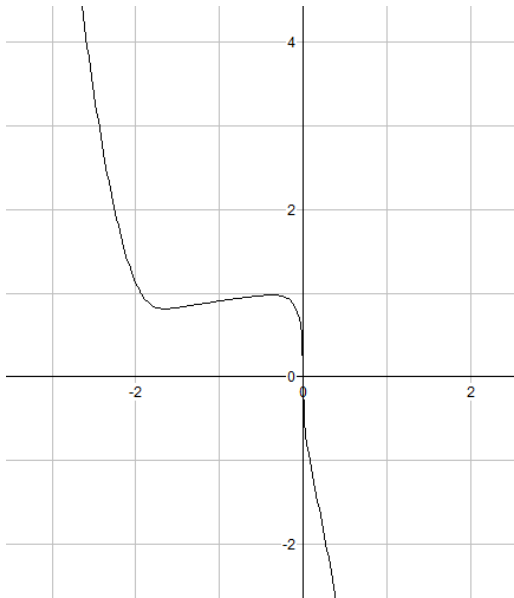
$$x^2 + 11(y - 2)^3 = y^3$$



Kiss

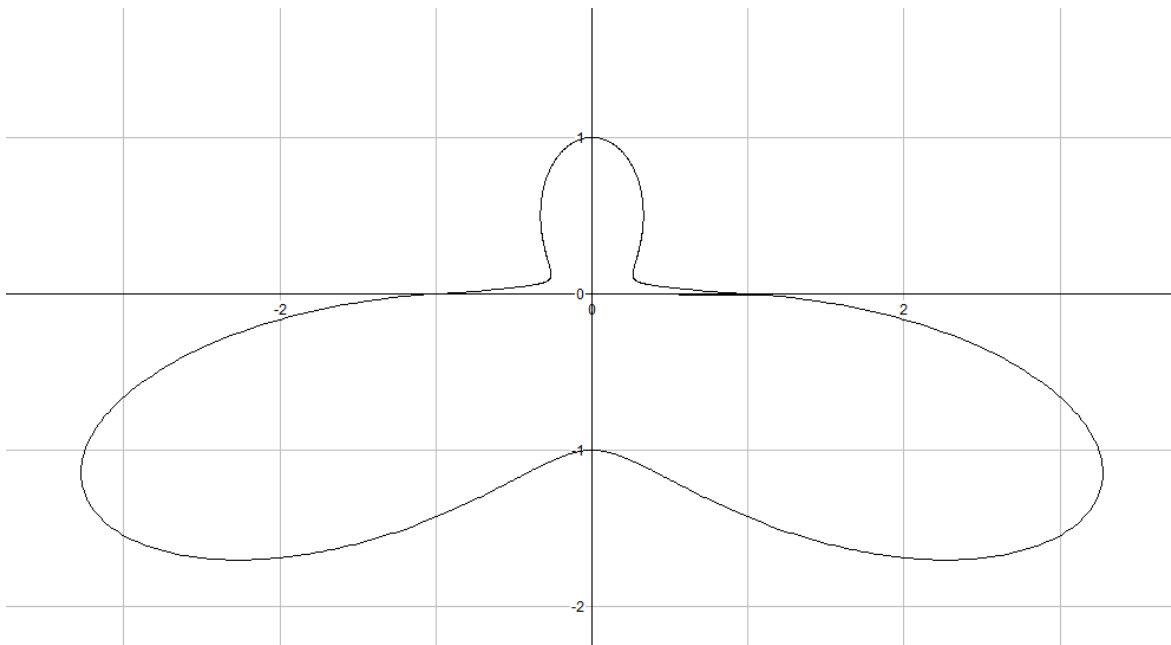
$$y^6 = x^{11} + y^2$$

$$(x - 3)^2 + 3(y - 4)^2 = 0.3$$



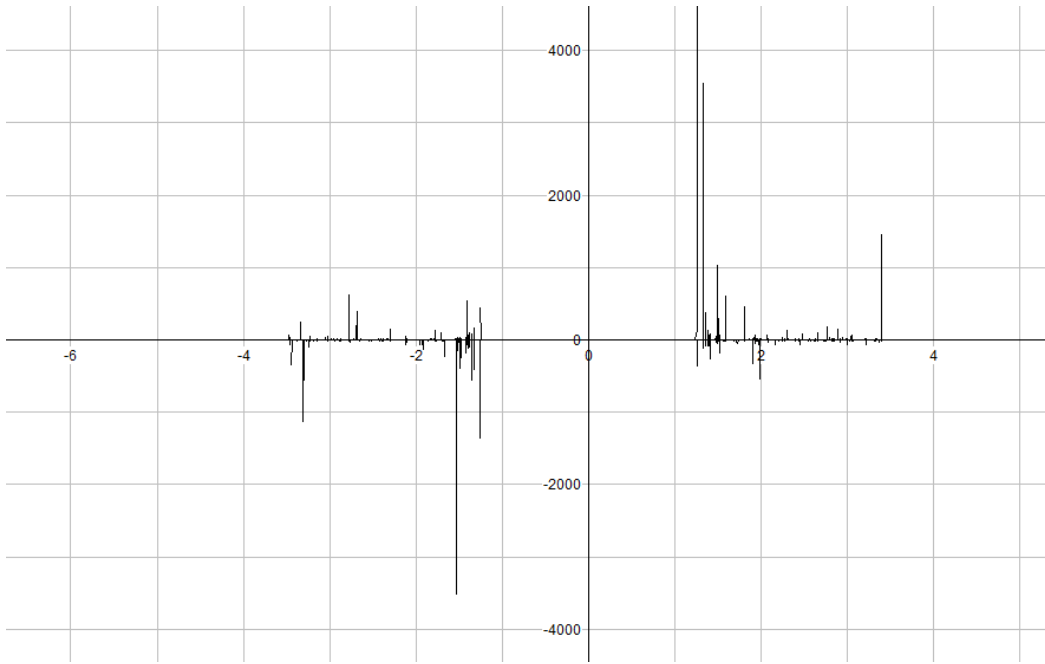
Chin

$$(x+1)^9 + y^3 = \frac{3}{x^2+3}$$



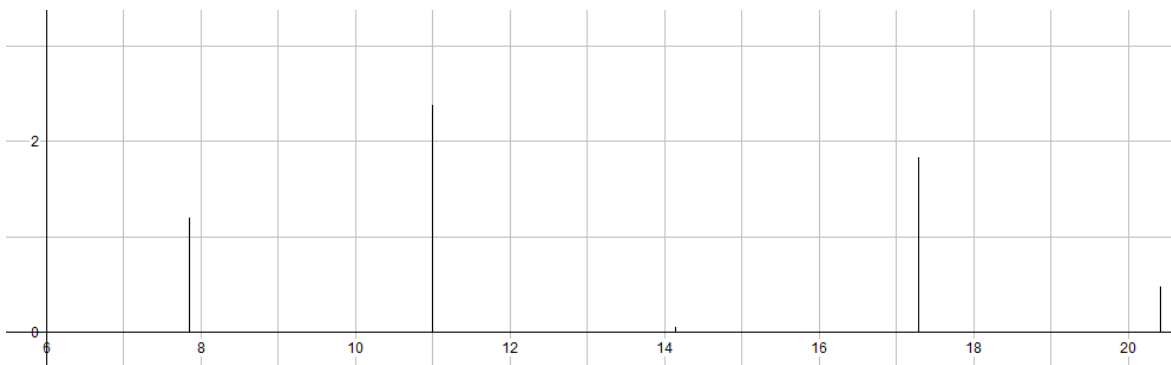
Sixth-formers' favourite

$$r = (\sin \theta \cos \theta \tan \theta)^{1.7 \sin \theta} \text{ for 1 rev}$$



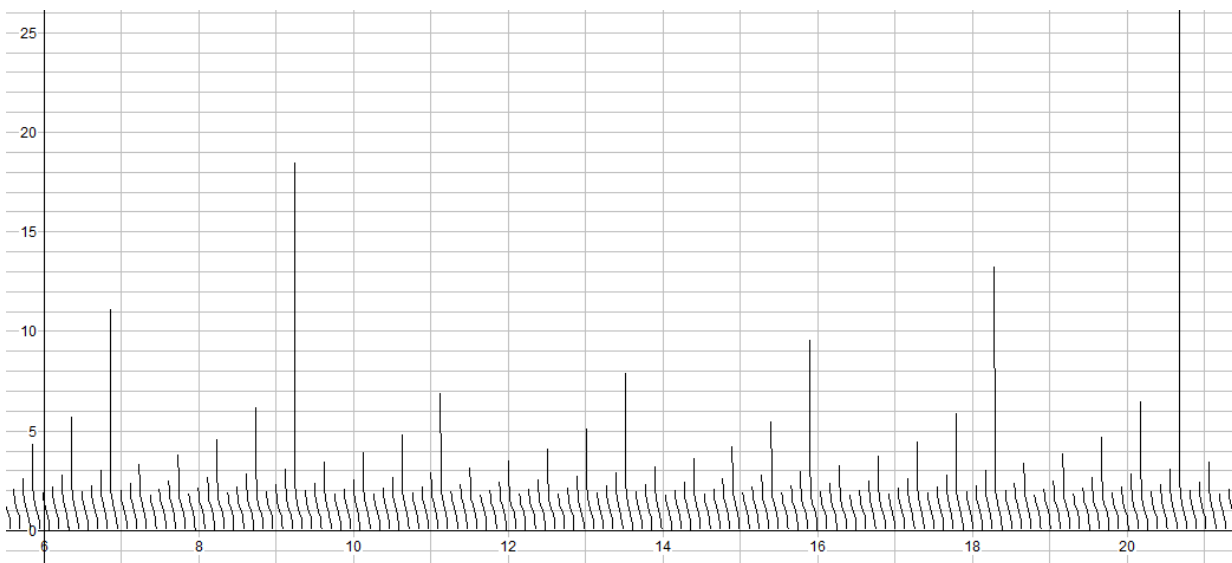
'Like an NMR spectrum in science'

$$\tan x^{20}$$



'Like a vertical line graph'

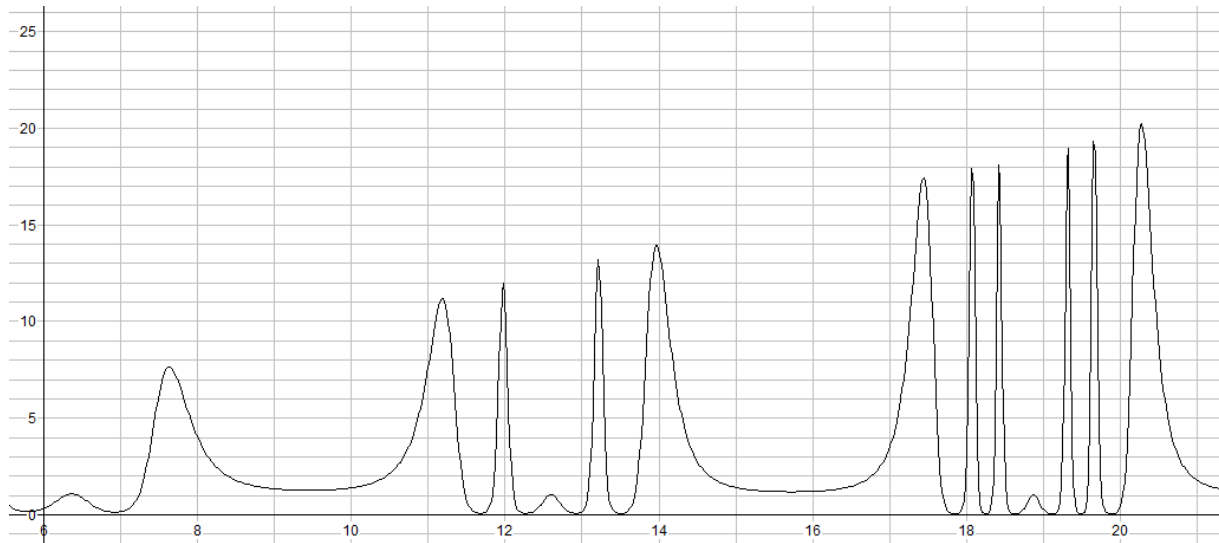
$$\sqrt{y} = \sin x + 3 \tan x$$



'Like a statistics graph'

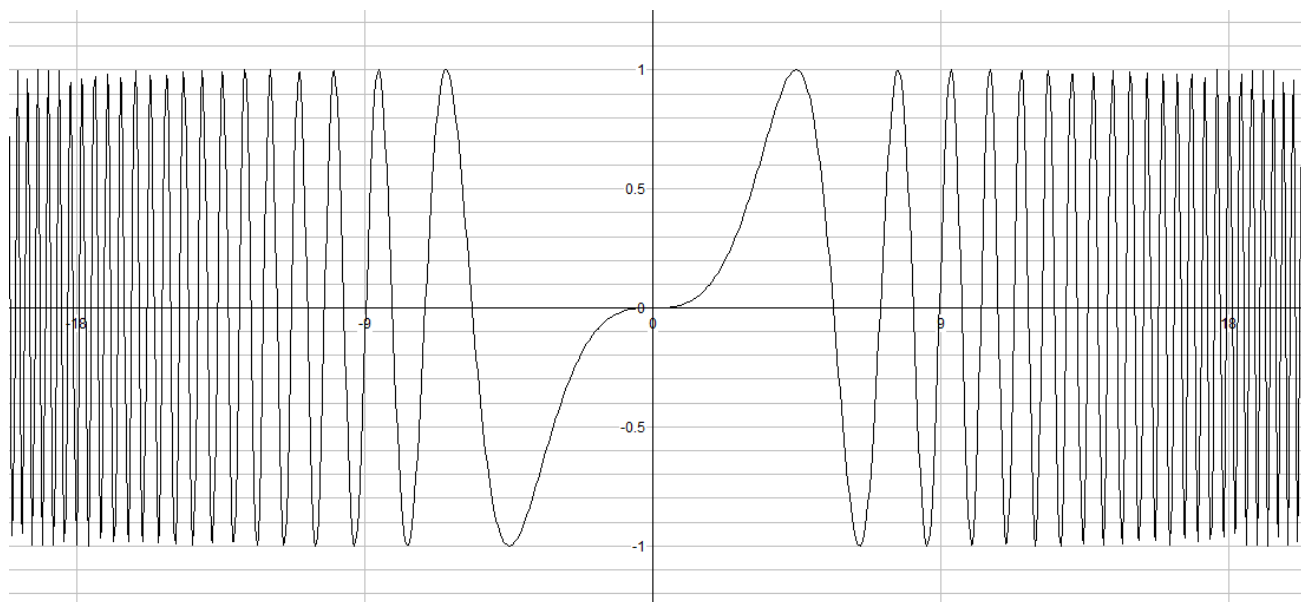
$$y = \sqrt{1 - \tan 25x}$$

What determines where the bigger peaks come?



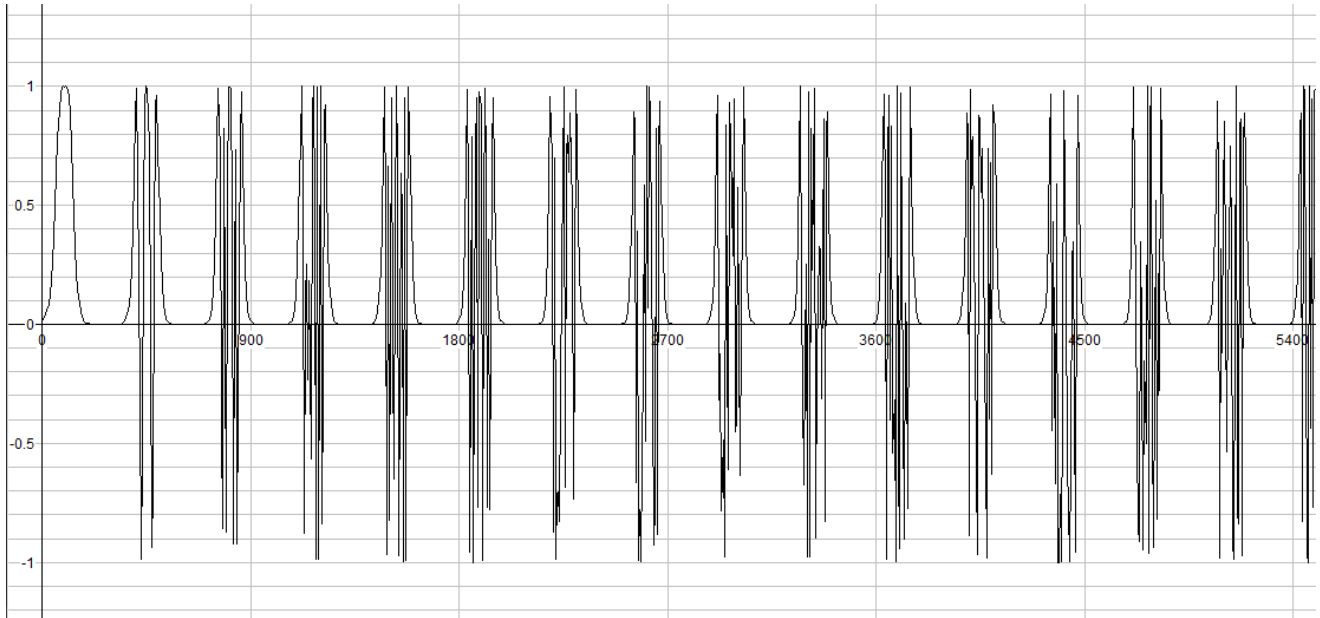
Wavy scientific graph

$$y = x^{(\sin x)^{\cos x}}$$



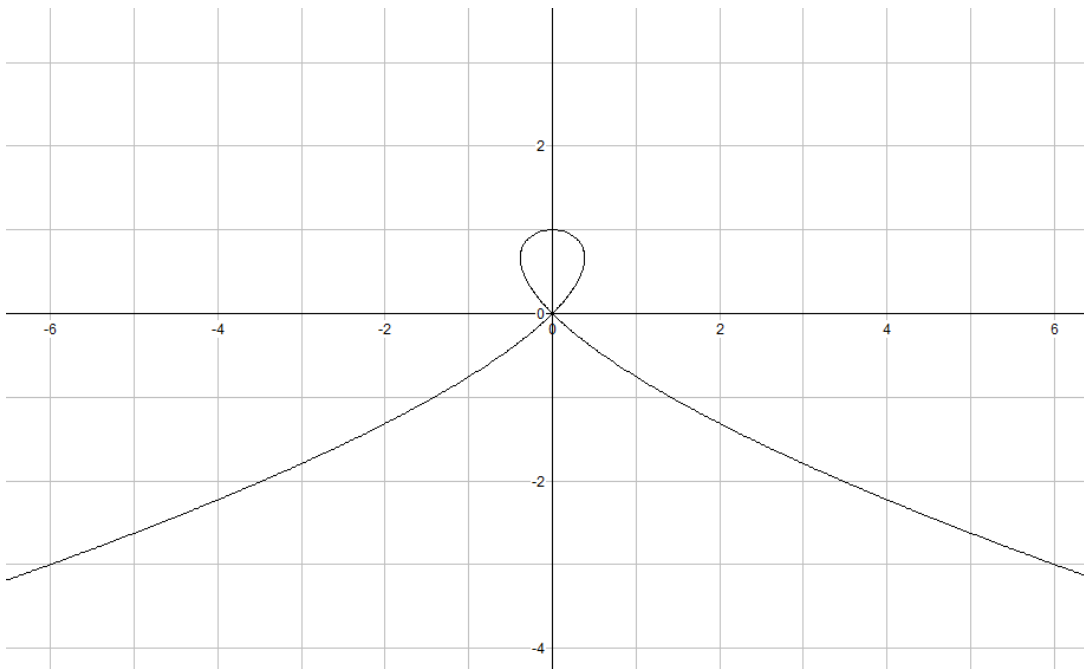
A cylinder viewed from the 'side'

$$y = \sin(x^3)$$



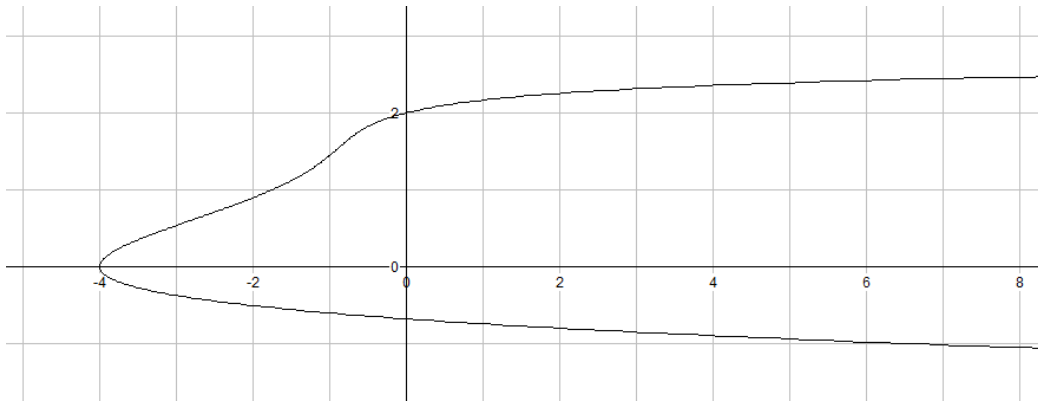
Repeats within repeats

$$y = (\sin x)^{\sin x}$$



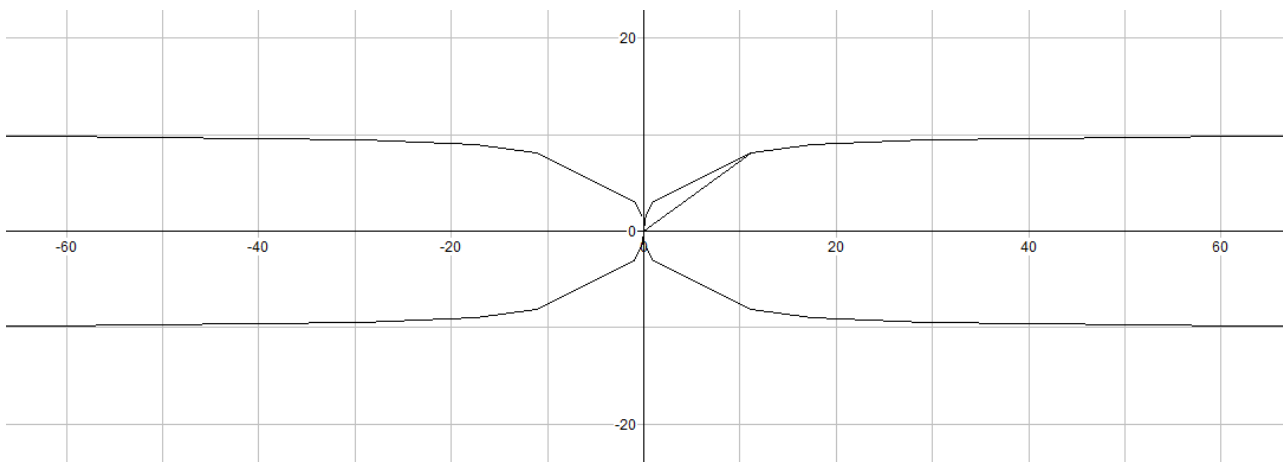
Loopy

$$y^2 = x^2 + y^3$$



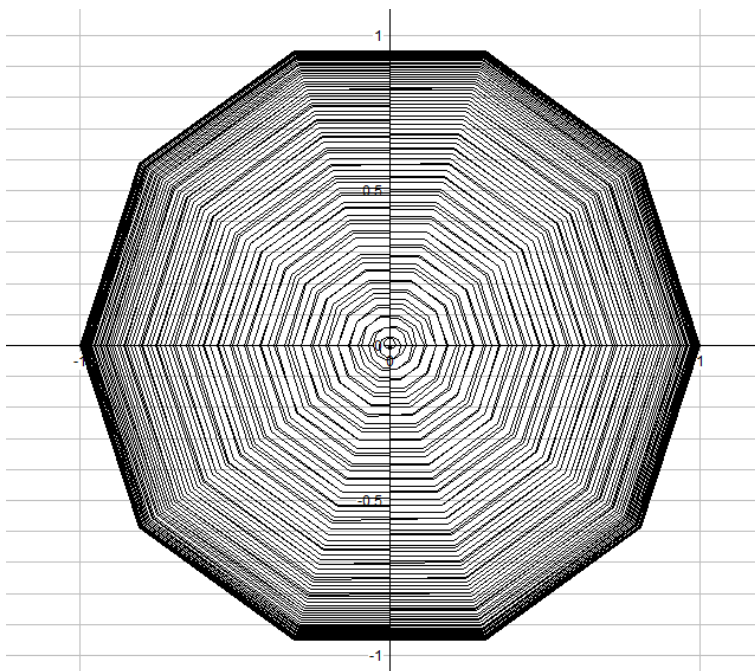
Aeroplane

$$(1-y)^2 + \sqrt{x+4} = \frac{3}{3-y}$$



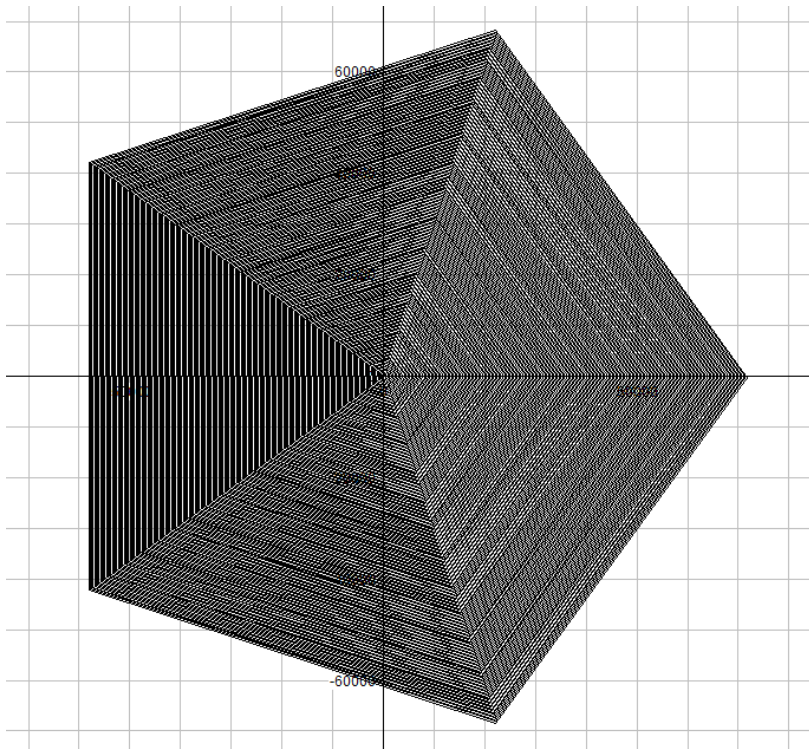
Train crash

$$r = 10 \cot \theta \text{ for 100 revs}$$

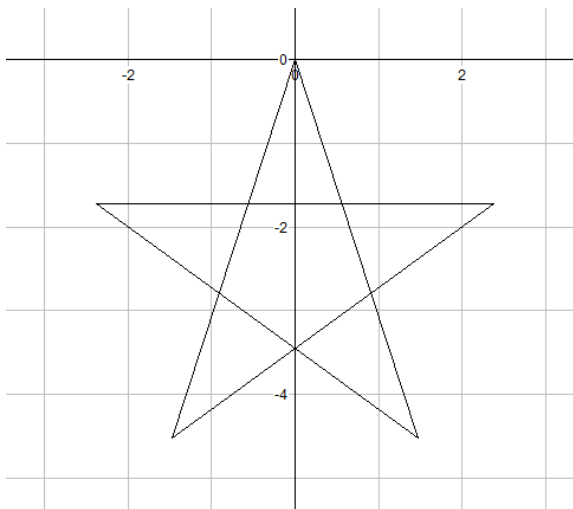


Regular decagon

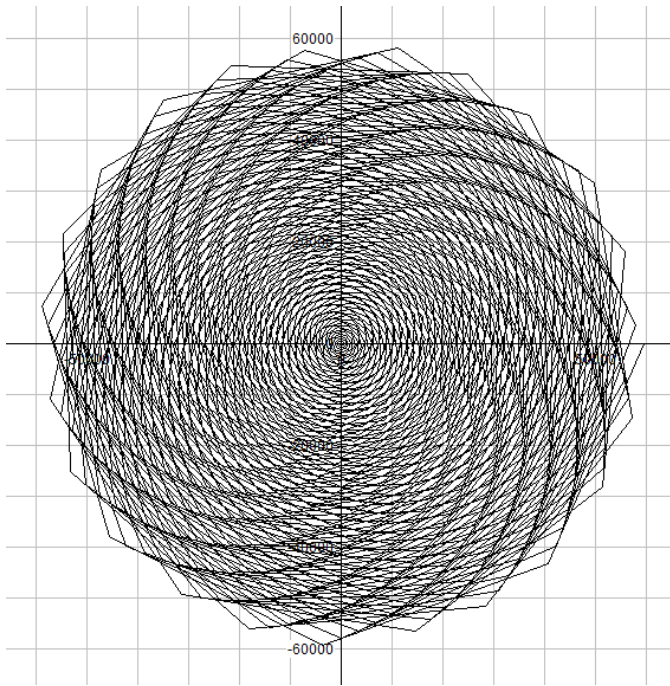
$$r = \cos(1 + \sqrt{\theta}) \text{ for 100 revs}$$



Regular pentagon
 $r = \theta$ for 200 revs

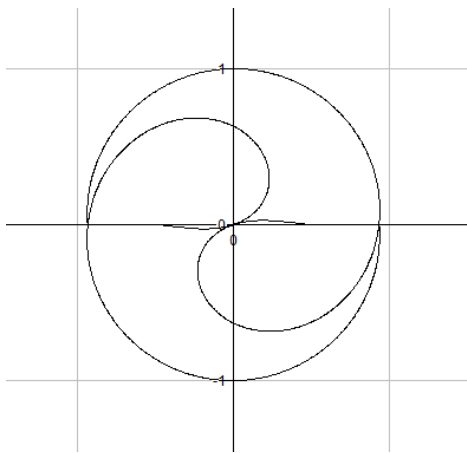


Pentagram
 $r = 10 \cos 2\theta \sin 2\theta$ for 200 revs



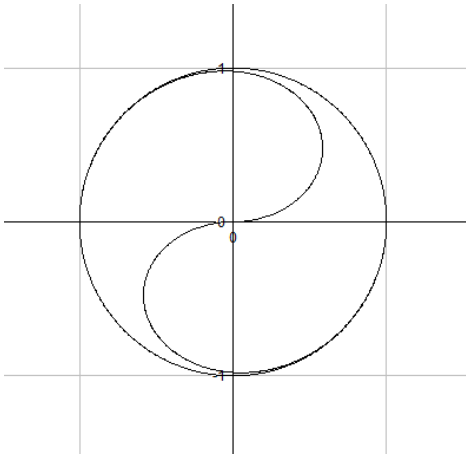
'Wow'

$$r = \frac{4\theta}{\pi} \text{ for 130 revs}$$



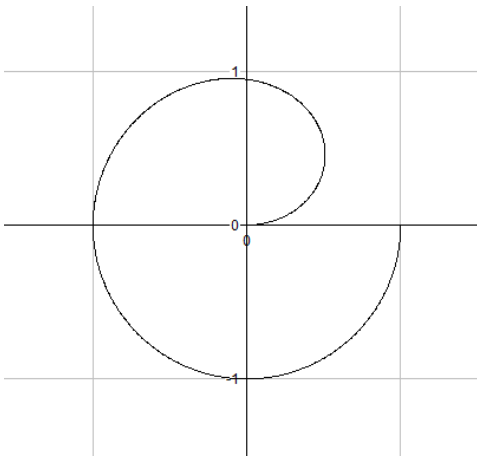
Ying yang 1

$$r = \pm \cos \sqrt{\theta+1} \text{ for 1 rev}$$



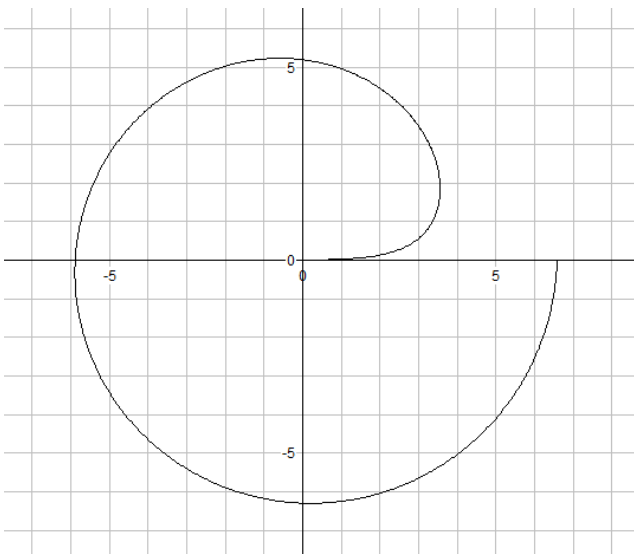
Ying yang 2

$$r = \pm \tanh \frac{\theta}{40} \text{ for 1 rev}$$



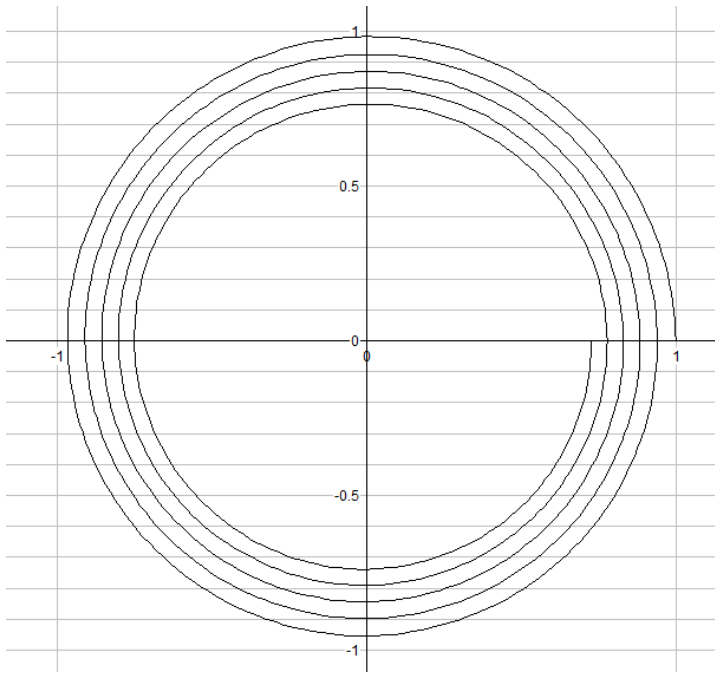
'e' 1

$$r = \tanh \frac{\theta}{50} \text{ for 1 rev}$$



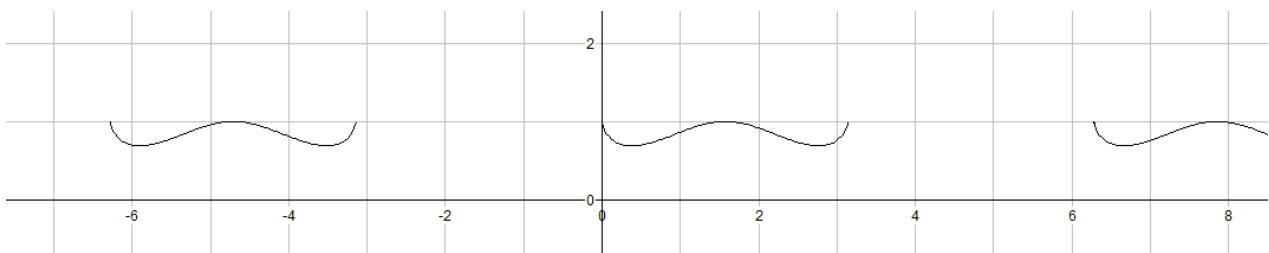
'e' 2

$$r = \operatorname{arccosh} \theta \text{ for 1 rev}$$



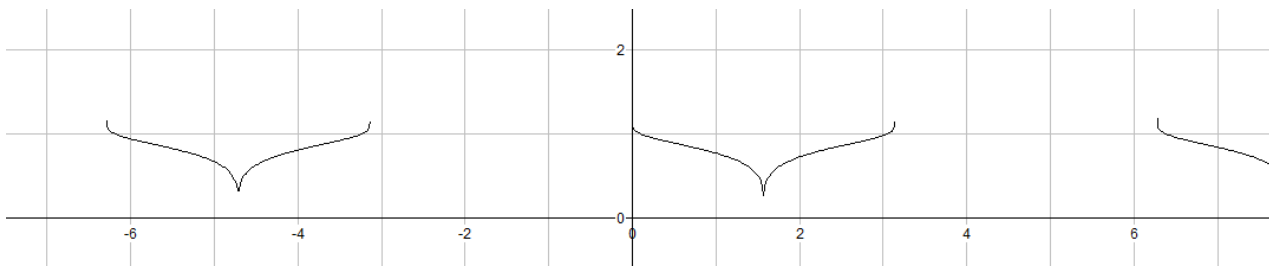
Spiral

$r = \cos(1 + \sqrt{\theta})$ for 5 revs



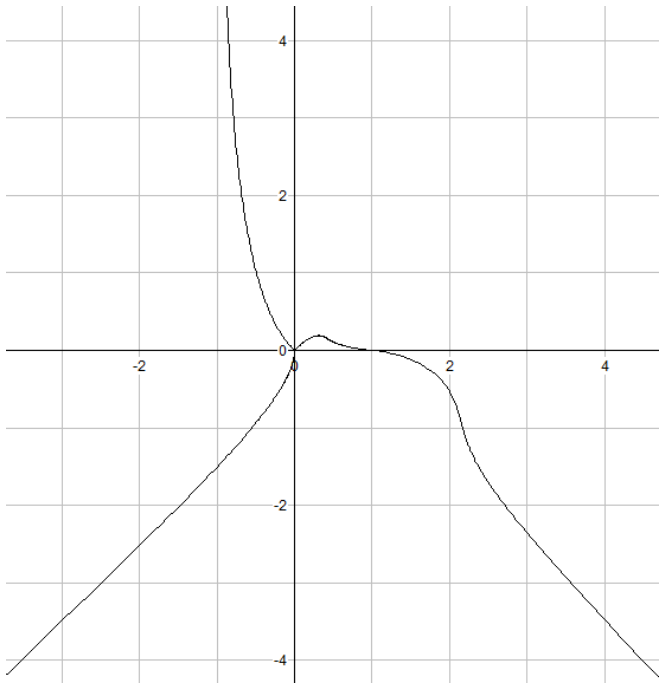
Brackets 1

$y = (\sin x)^{\sin x}$



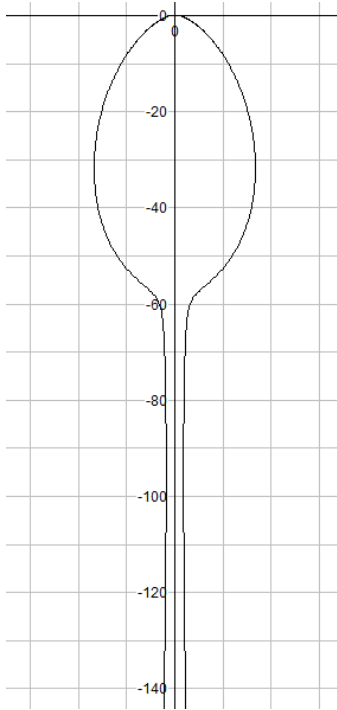
Brackets 2

$y = \sqrt[10]{-\log(\sin x)}$



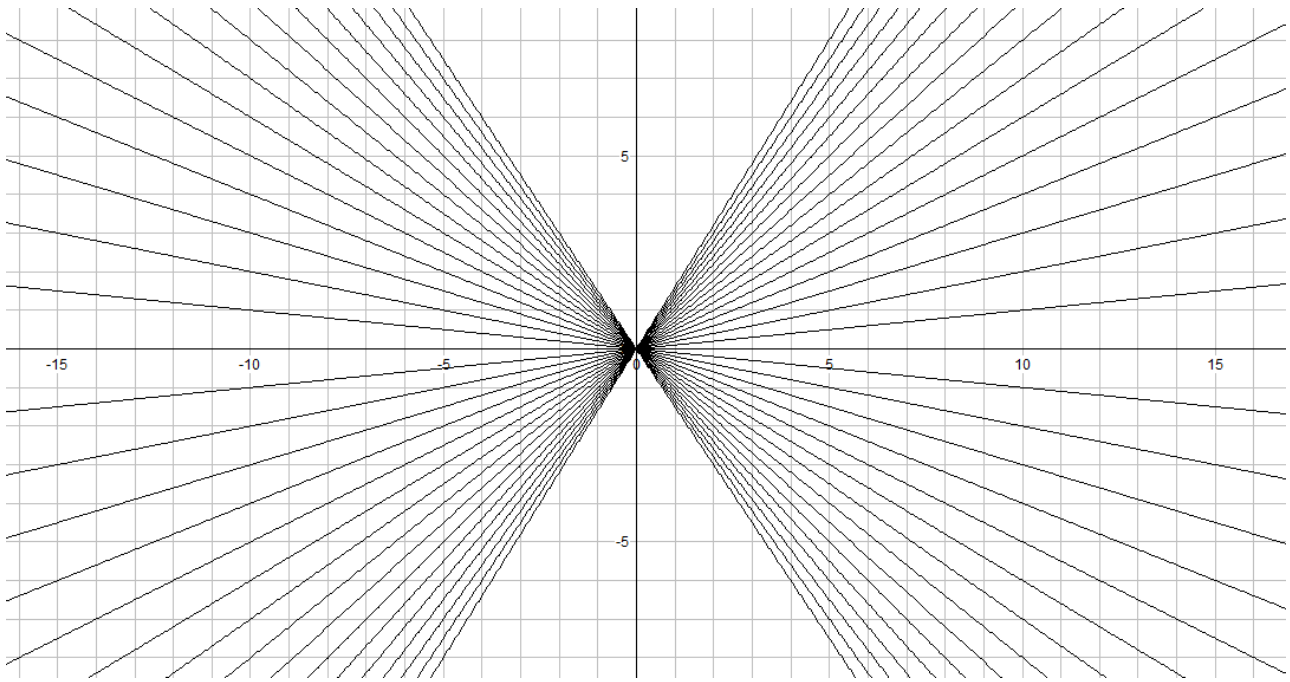
Road map

$$r = (\sin \theta \cos 2\theta \tan \theta)^{\sin \theta}$$



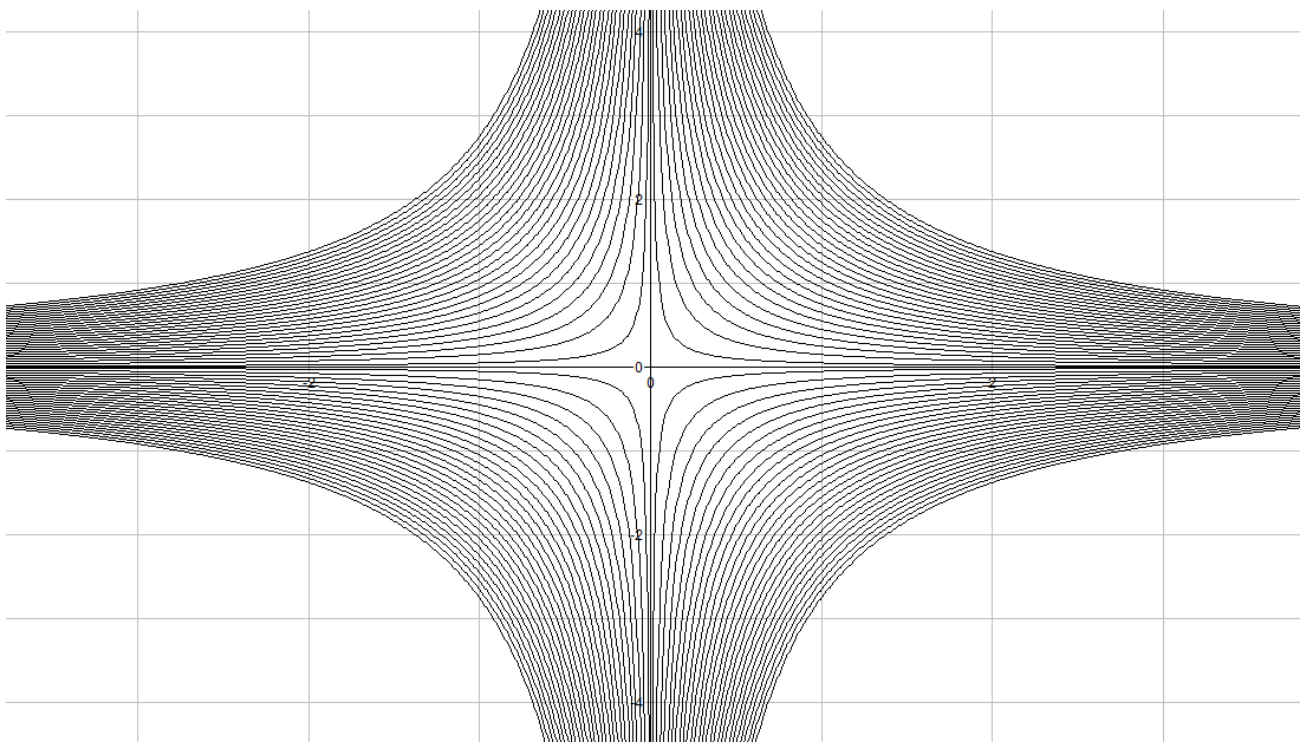
Spoon

$$r = (\sin \cos \tan \theta)^{\sin \theta} \text{ for 1 rev}$$



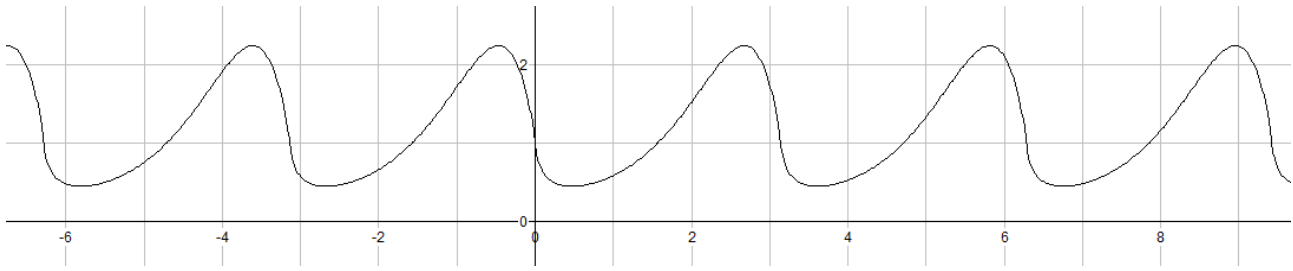
Long corridor

$$y = 0.05(1 \pm 1 \pm 2 \pm 4 \pm 8 \pm 16)x$$



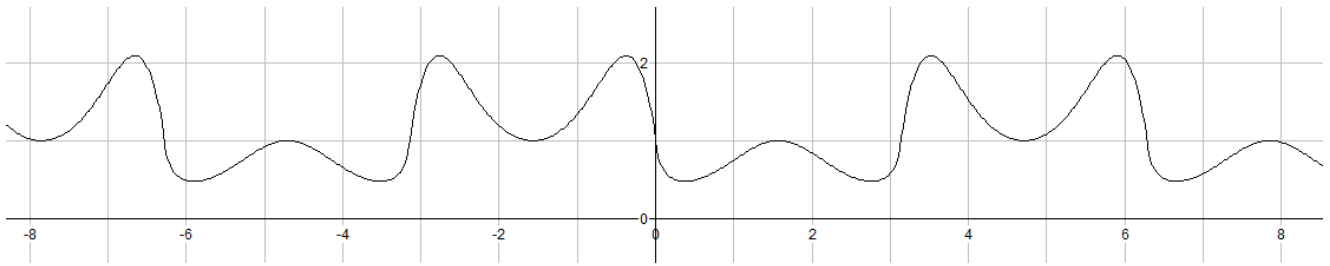
The slowest one to draw!

$$y = \frac{\pm 1 \pm 2 \pm 3 \pm 4 \pm 5 \pm 6 \pm 7 \pm 8 \pm 9 \pm 10}{20x}$$



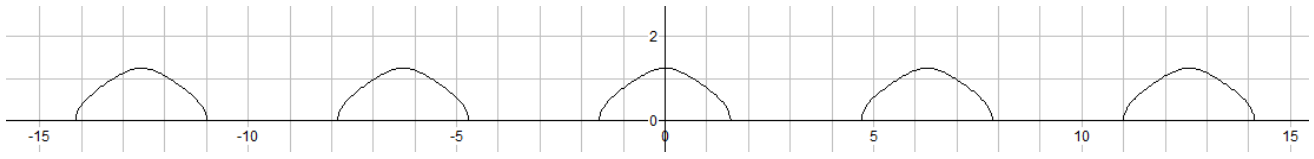
Rough sea

$$y = (\sin x \cos x \tan x)^{\tan x}$$



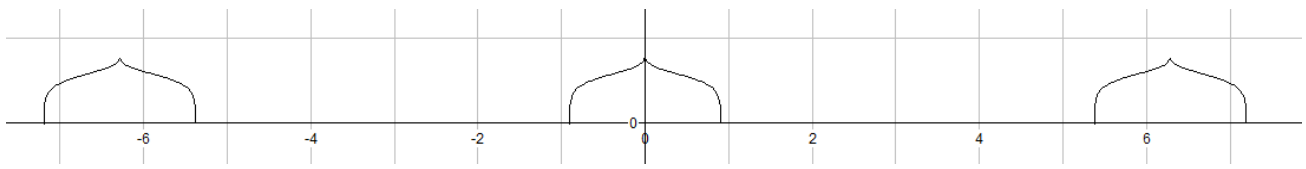
Very rough sea

$$y = (\sin x \cos x \tan x)^{\sin x}$$



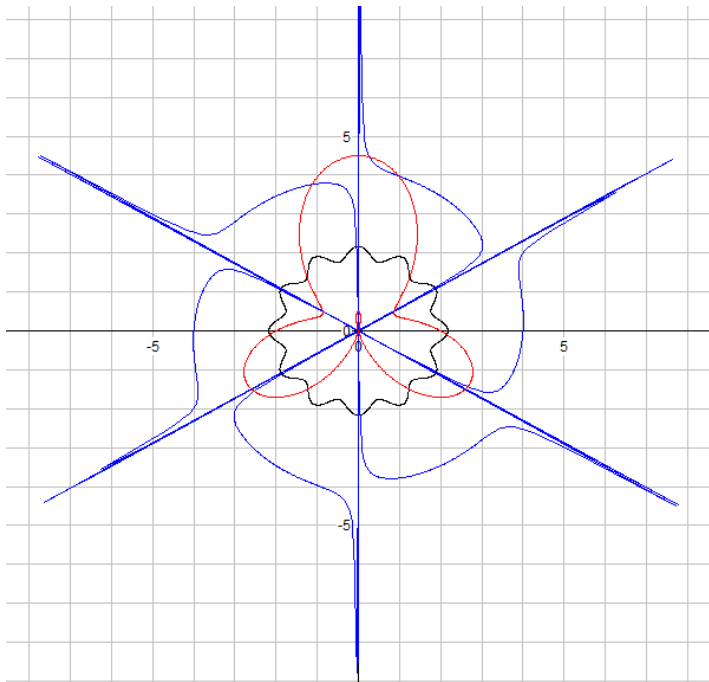
Scones on a tray

$$y = \sqrt{\tan \cos x}$$



Meringues on a tray

$$y = \sqrt[10]{-\log(\tan x \sin x)} - 0.4$$



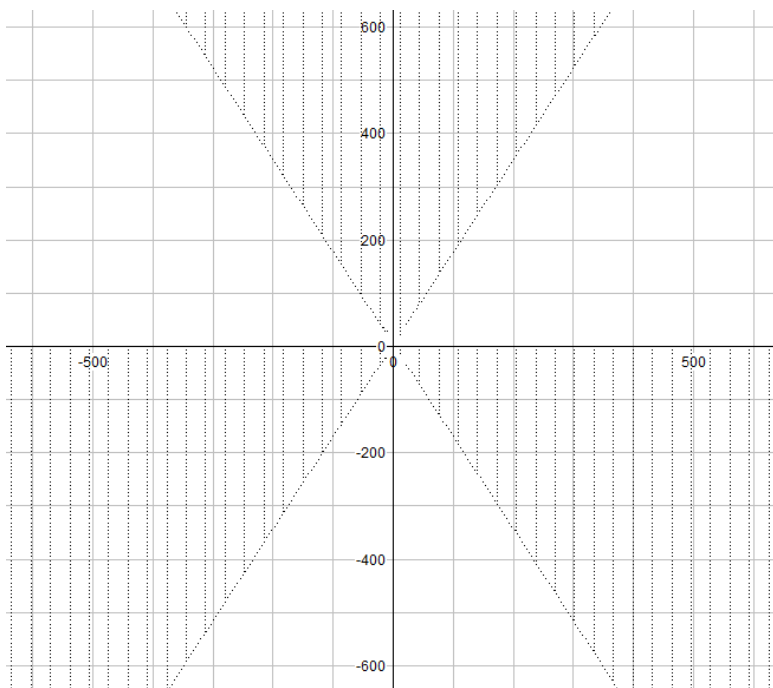
Symmetry

Can you tell which equation produces which curve?

$$r = 2 + 10 \sin \cos 12\theta \text{ for 1 rev}$$

$$r = 4 + 5 \sin \tan 3\theta \text{ for 1 rev}$$

$$r = 2 - 1.5 \sin 3\theta + \sin \theta \text{ for 1 rev}$$



Triangles

$$(y - 3)^3 + (y - 2)^2 + x + 1 \geq 3x^2 y$$

Can you justify why this drawing has an order of rotational symmetry of 3?

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