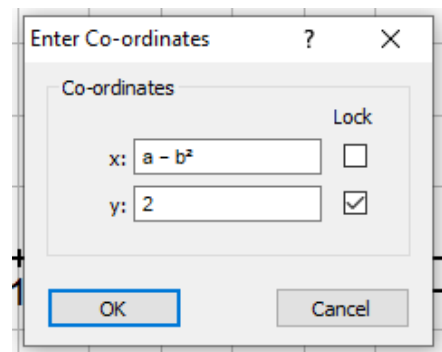


# #MathsConf *Mini* “Autograph 1-2-3!”

## • 1 POINT

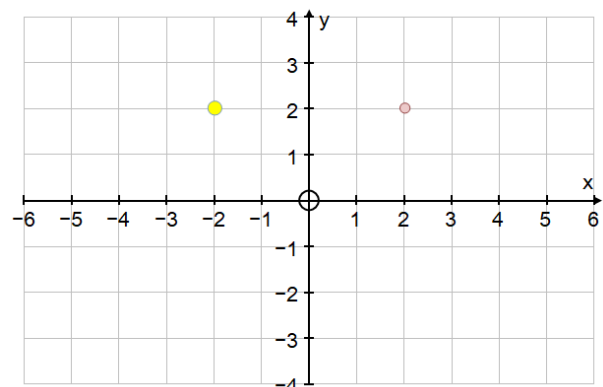
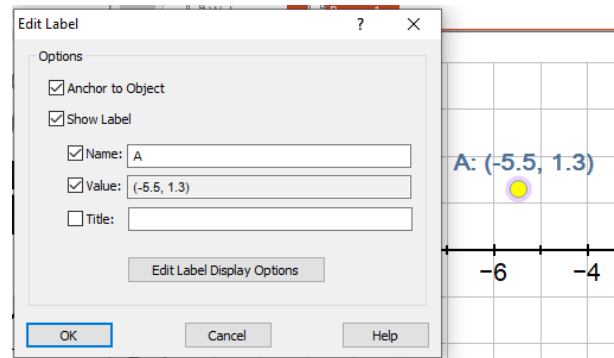
### TO CREATE A SINGLE FREE POINT

- Point Mode: Point and click
- Main: Enter Co-ordinates (x and y)
  - Can include parameters
  - Can be locked



### OPTIONS FOR 1 SELECTED FREE POINT on a 2D page:

- Main:
  - Edit/show label
  - Edit draw options
  - Hide point
  - Trace point
- Point: XY Attribute Point (enter attributes)
- Line:
  - Horizontal Line
  - Vertical Line
  - Gradient Line (enter gradient)
  - Fixed Length Line (enter length)
- Circle: Circle (enter radius)
- Vector: Vector (enter a, b)
- Transform:
  - reflection in an axis
  - shear along an axis
  - stretch along an axis
  - Matrix transformation

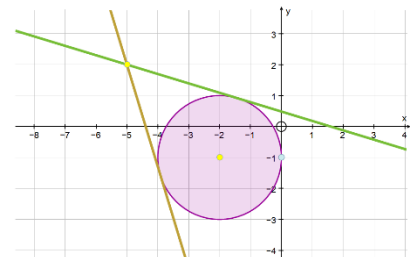


- Arrows: Move point in x, y direction by current snap setting
- CTRL Moves snap/10
- SHIFT-CTRL Moves snap/100
- SHIFT Moves snap x 10



## ONE POINT AND ANOTHER OBJECT SELECTED

- Point + line, vector, line segment Transform -> Reflection
- Point + circle Tangent (2 possibilities)
- Point and graph Attach (same 'x')

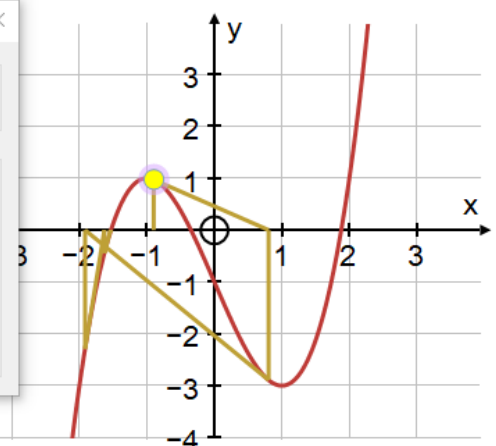
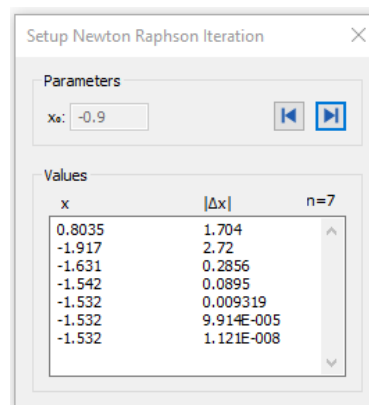


## TO CREATE A SINGLE POINT ON A GRAPH

- Point mode: point and click (wait for little black arrow)
- Intersection mode: finds roots, turning points and axes intercepts (wait for little circle)
- Select the graph "Enter point on Curve": enter a value for 'x', can involve constant(s)
- Select a free point and the graph: "Attach to object" (at same value of 'x')

## EXTRA OPTIONS FOR 1 POINT ATTACHED TO A GRAPH

- Point: Move to next  $f(x) = 0$   
Move to next  $f'(x) = 0$
- Line: Tangent  
Normal  
Unit Gradient ( $\Delta x = 1$ )
- Create Newton-Raphson Iteration



Equation 1:  $y = x^3 - 3x - 1$

# • 2 POINTS

## TO CREATE 2 SELECTED POINTS

Point mode: Hold SHIFT as you point and click

## EXTRA OPTIONS FOR 2 FREE SELECTED POINTS on a 2D page:

zPoint mode: Create Line Segment

- Main: Create Vector
- Create circle
- Edit/show label
- Trace points
- Convert to data set

- Point: Mid-point
- Ratio

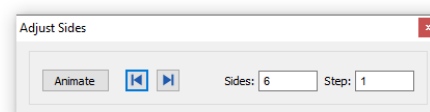
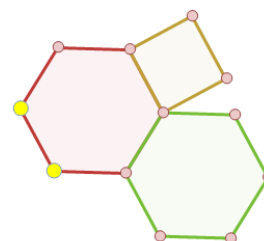
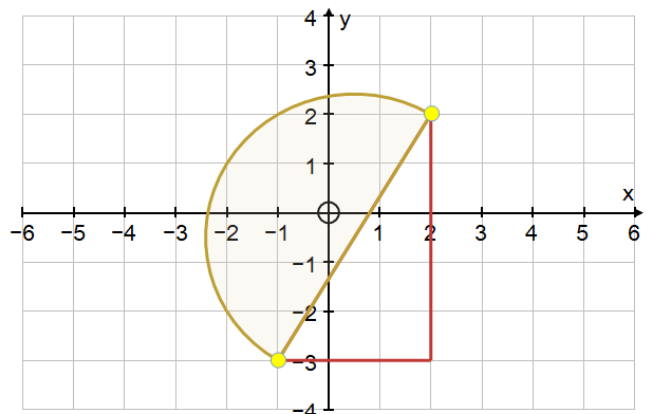
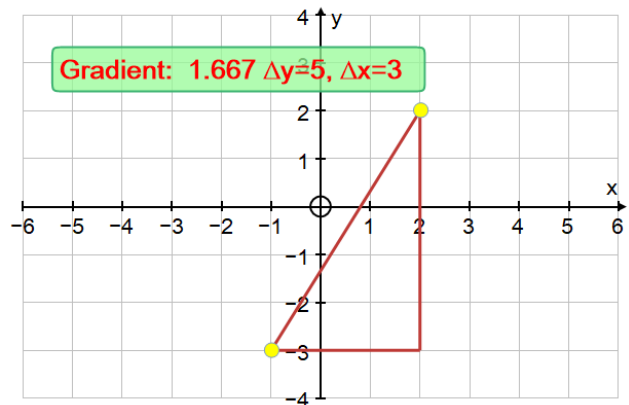
- Line: Straight Line
- Ray
- Line Segment
- Gradient
- Perpendicular Bisector

- Circle: Circle (centre and point)
- Circle (diameter)
- Semi-circle

Vector: Vector

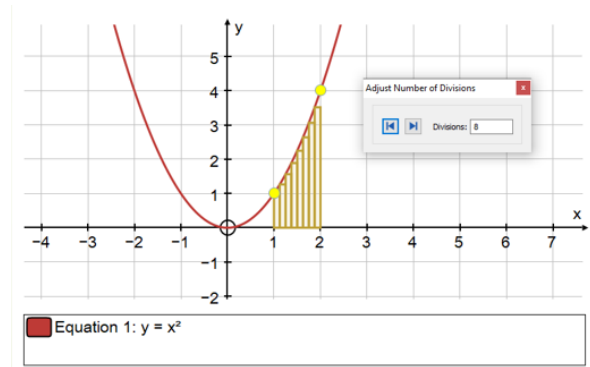
- Create: Quadratic (2pts + Gradient)
- Angle (enter angle, clockwise etc)
- Rectangle (enter Height)
- Regular Polygon (Centre and Point)
- Regular Polygon (2 Points)
- Equally Spaced points

- Transform: Rotation
- Enlargement



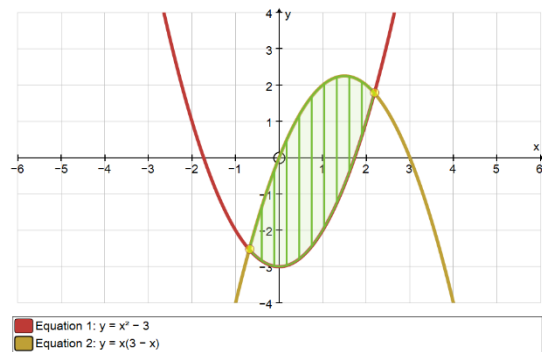
## EXTRA OPTIONS FOR 2 SELECTED POINTS ON A GRAPH

- Point: Mid-point on Curve
- Create: Bisection Iteration
- Arc Length
- Area



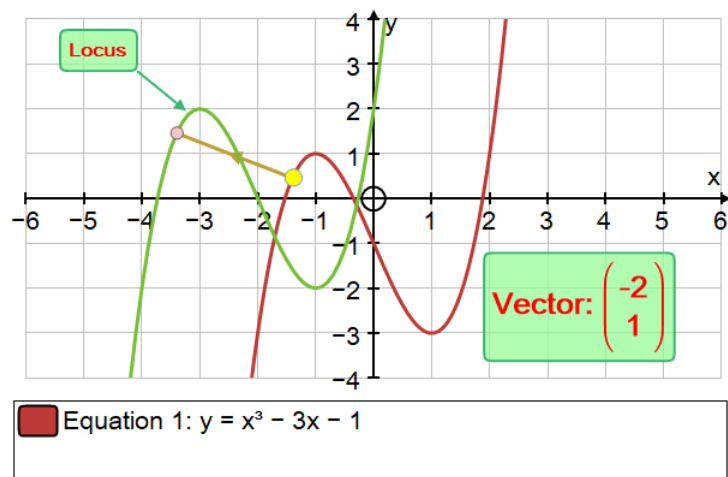
## AREA BETWEEN TWO CURVES

- Use Intersection mode to find intersections
- Select the two intersections (lower then upper)
- Select the two graphs (upper then lower)
- Create: Area



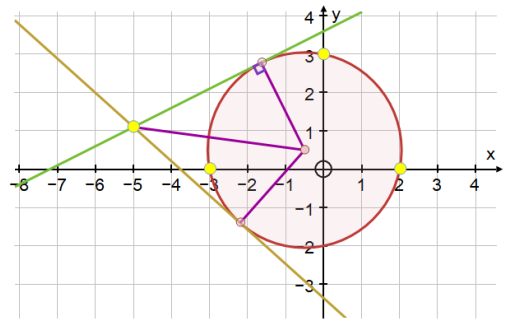
## OPTION FOR 1 POINT ON A GRAPH and second RELATED POINT

- Create: Locus



**EXTRA OPTIONS FOR 3 SELECTED POINTS on a 2D page:**

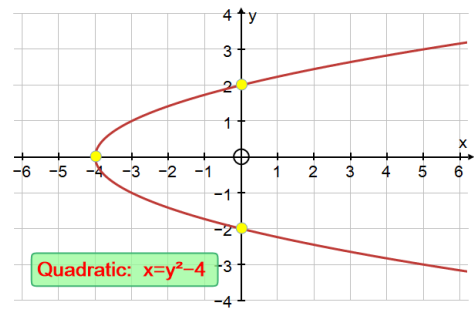
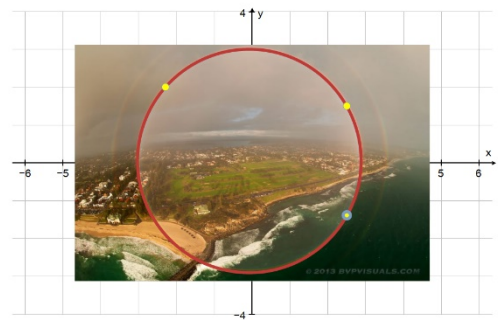
- Main: Group to Shape
- Point: Mean
- Line: Angle Bisector  
x-on-y Regression Line  
y-on-x Regression Line
- Circle: Circle (3 pts)



- Centre of Circle
- Sector
- Sector (with centre)
- Segment
- Segment (with centre)
- Arc



- Arc (with centre)
- Ellipse
- Create: Quadratic (3 pts)  
Quadratic  $x = f(y)$   
Cubic (3 pts + gradient)  
Best Fit Polynomial
- Angle
- Shaded Area



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**• 4 POINTS**

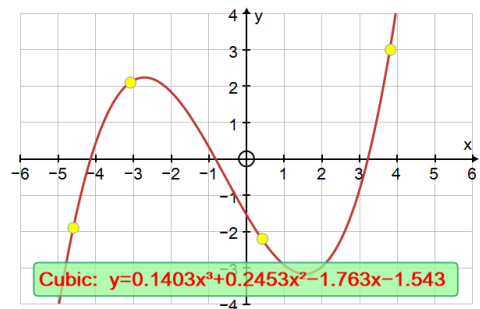
- Create: Cubic (4 pts)

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**• 5 POINTS**

- Create: Conic (5 pts)

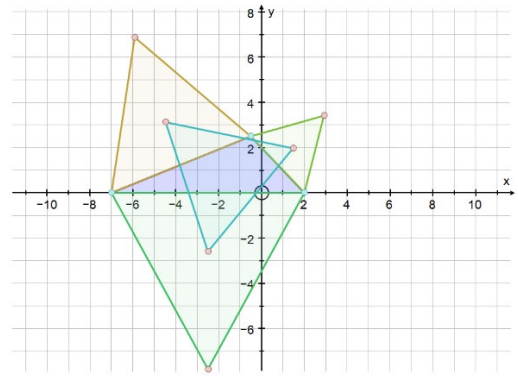
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# EXERCISES

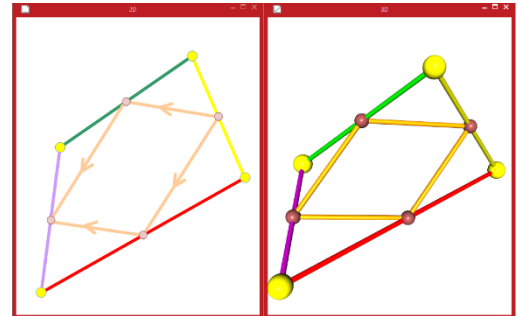
## 1. EQUILATERAL TRIANGLES

The means of three equilateral triangles on the sides of a scalene triangle, form an equilateral triangle.

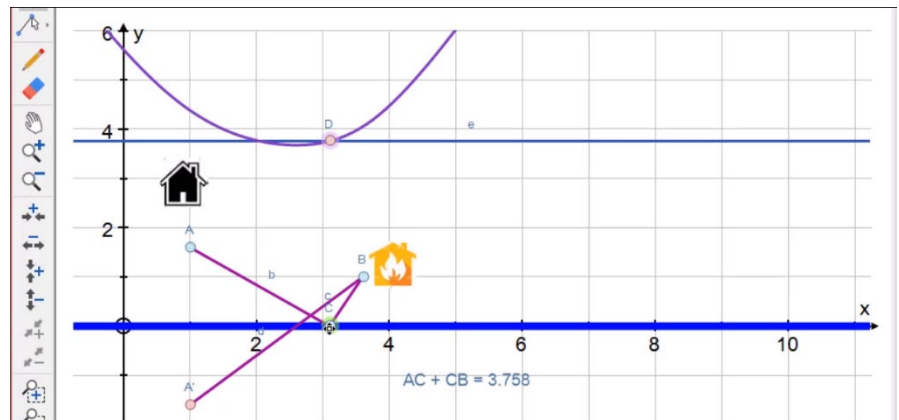


## 2. 2D and 3D

The mid-points of sides of a random quadrilateral form a parallelogram in 2D and 3D!

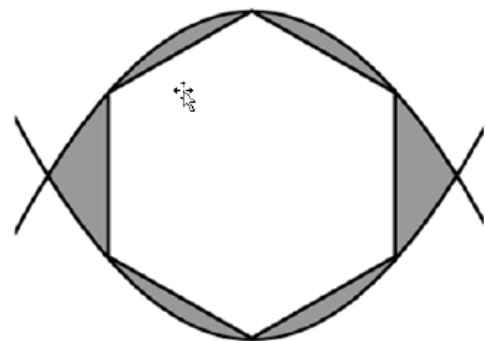


## 3. HERON'S PROBLEM



## 4. HEXAGON PROBLEM

Find the area between the parabolas and the regular hexagon



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### Autograph Resources

Press F4

