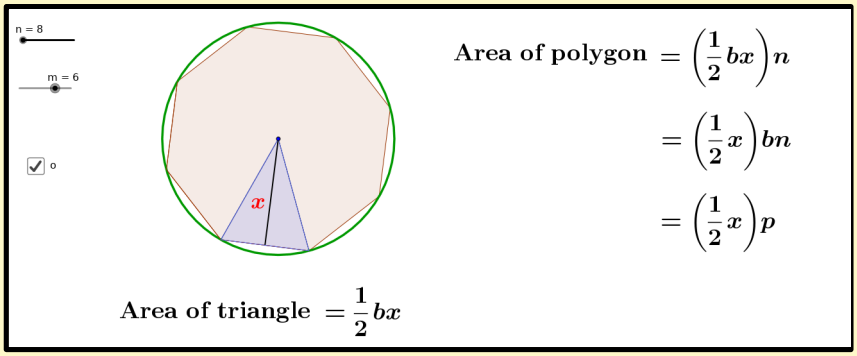
CIET Training

Developing e Content for Teaching and Learning of Mathematics

Calculus

* Limits

Area of a circle - through polygons

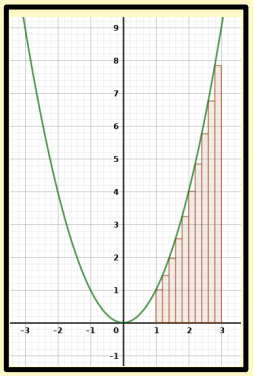


Area under a curve - limit of a sum

Lowresum command

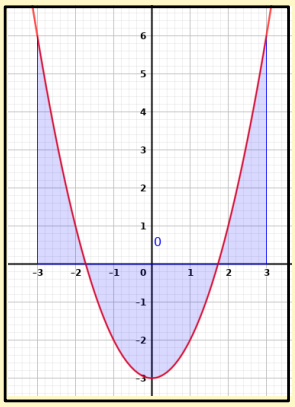
Uppersum command

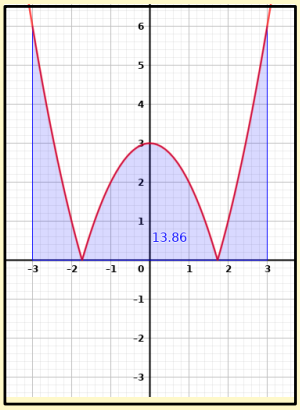
Definite integral - command



Curves above and below x axis

$$x^3 - 3 \text{ betwen } -3 \text{ and } 3$$





Limit of Functions

Left limit - Right limit

Non existance

epsilon delta definition

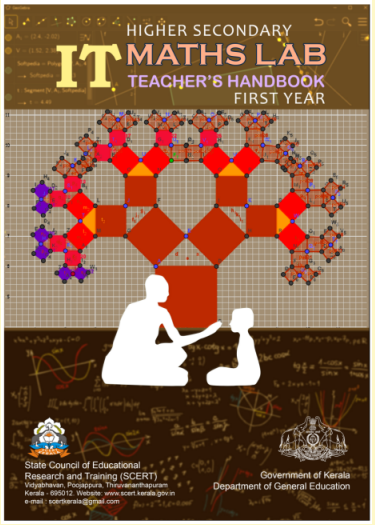
$$\lim_{x \to 0} \frac{\sin x}{x} = 1$$

$$x^2 \ , \sin x^2 \ , \sin^2 x \ , \ldots$$

Taylor expansion of sin(x)

$$\text{Graphs of } \ \sin \frac{1}{x} \ , \ x \sin \frac{1}{x} \ , \ldots$$

IT Maths Lab - SCERT Kerala



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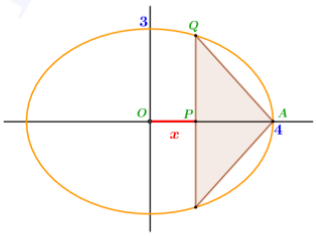
Activity 31.3 Visualisation of Problems - 3

1. Find the maximum area of an isosceles triangle inscribed in the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ with its vertex at one end of the major axis. Verify your answer by constructing a GeoGebra applet.

Procedure

- Taking $OP = x$, find PA and PQ in terms of x (use the equation of the ellipse)
- Find the area of the triangle as a function of x (say $f(x)$)



Plot the graphs of $f(x)$ and $f'(x)$ and find the maximum as we did in the previous exapmles.

Verification :

- Draw the ellipse and plot the point $A(4, 0)$
- Plot a point B on the ellipse and plot another point $C(x(B), -y(B))$
- Using Polygon tool draw the triangle ABC and find its area.

Change the position of B and find the maximum area of the triangle.

* Derivatives

Tangent to a curve - meaning - graph of sin(x) - limiting case of secant

Visualisation - Slop of tangent

Non differentiability - sharp turn

* Applications of derivatives

Maxima and Minima

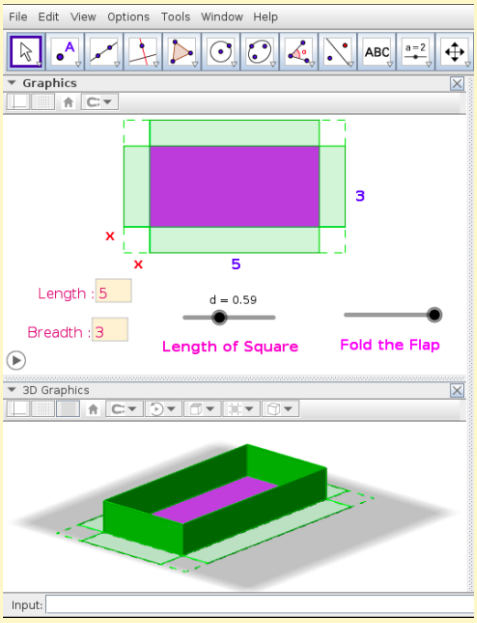
$$x^2 - 6x + 10$$

$$9x^2 + 12x + 2$$

$$2x^3 - 15x^2 + 36x + 1$$

* Visualisation of Problems

An open topped box is to be constructed by removing equal squares from each corner of a 3 metre by 8 metre rectangular sheet of aluminium and folding up the sides. Find the volume of the largest such box using derivatives. Verify your answer using the given applet



INPUT COMMANDS

x^2: x^2

Lower sum : LowerSum(f, 1, 3, n)

Upper sum : UpperSum(f, 1, 3, n)

Definite Integral : Integral(f,1,3)

If(x<=2,x^2,2x+1)

TaylorPolynomial(sin(x), 0, n)