Calculus Cheat Sheet

Visit

Derivatives

Definition and Notation

If then the derivative is defined to be $\lim_{0}$.

If then all of the following are equivalent notations for the derivative.

If all of the following are equivalent notations for derivative evaluated at .

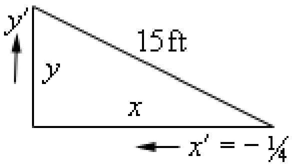
Interpretation of the Derivative

If then,

Related Rates

Sketch picture and identify known/unknown quantities. Write down equation relating quantities and differentiate with respect to using implicit differentiation (add on a derivative every time you differentiate a function of). Plug in known quantities and solve for the unknown quantity.

Ex. A 15 foot ladder is resting against a wall. The bottom is initially 10 ft away and is being pushed towards the wall at $\frac{1}{4}$ ft/sec. How fast is the top moving after 12 sec?



is negative because is decreasing. Using Pythagorean Theorem and differentiating,

$^2 \quad ^2 \quad 15^2 \qquad 2 \qquad 2 \qquad 0$

After 12 sec we have $10 \quad 12 \; \frac{1}{4} \quad 7$ and so $\sqrt{15^2 \quad 7^2} \quad \sqrt{176}$. Plug in and solve for .

$7 \quad \frac{1}{4} \quad \sqrt{176} \qquad 0 \qquad \frac{7}{4\sqrt{176}}$ ft/sec

Ex. Two people are 50 ft apart when one starts walking north. The angle changes at 0.01 rad/min. At what rate is the distance between them changing when 00.(

Integrals

Definitions

Definite Integral: Suppose is continuous on , . Divide , into subintervals of width and choose * from each interval.

Then lim * .
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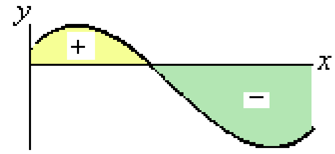
Anti-Derivative : An anti-derivative of is a function,

Applications of Integrals

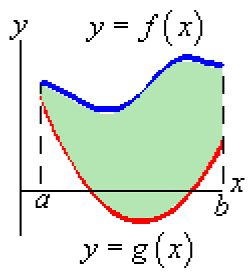
Net Area : represents the net area between and the -axis with area above -axis positive and area below -axis negative.

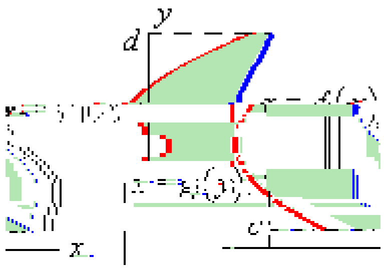


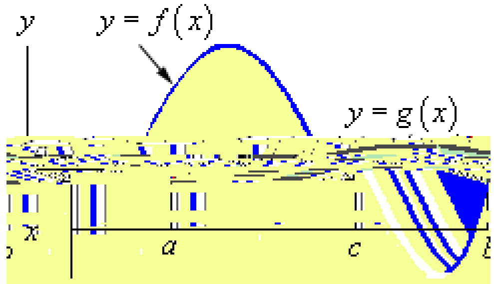
Area Between Curves : The general formulas for the two main cases for each are,

upper function lower function ∑& ≈ ∑ right function left function ∑ ≈ ∑

If the curves intersect then the area of each portion must be found individually. Here are some sketches of a couple possible situations and formulas for a couple of possible cases.



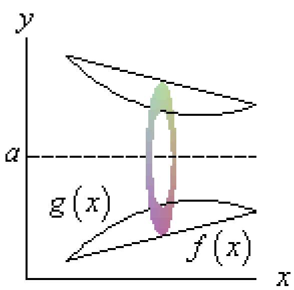




Volumes of Revolution : The two main formulas are and . Here is some general information about each method of computing and some examples.

Rings	**Cylinders**
outer radius ^{2} inner radius ^{2}	2 radius width / height
Limits: / of right/bot ring to / of left/top ring	Limits : / of inner cyl. to / of outer cyl.
Horz. Axis use , Vert. Axis use ,	Horz. Axis use , Vert. Axis use ,
, and . , and .	, and . , and .

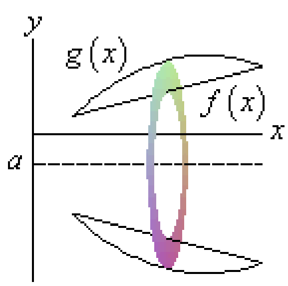
Ex. Axis : 0



outer radius :

inner radius :

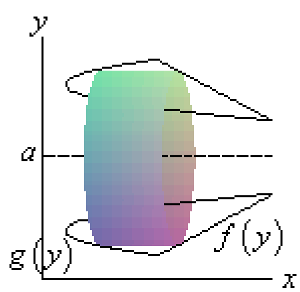
Ex. Axis : 0



outer radius:| |

inner radius:| |

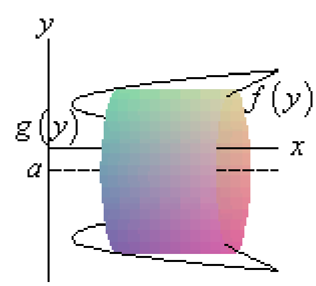
Ex. Axis : 0



radius :

width :

Ex. Axis : 0



radius :| |

width :

These are only a few cases for horizontal axis of rotation. If axis of rotation is the -axis use the 0 case with 0 . For vertical axis of rotation (0 and 0) interchange and to get appropriate formulas.

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