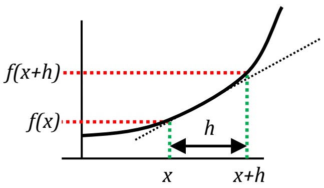
Calcu-List



$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

Vertical Motion in Feet and Seconds:

$a(t) = v'(t) = h''(t)$

$h(t) = -16t^2 + v_i t + h_i$

$v(t) = -32t + v_i$

$a(t) = -32$

Volumes of Rotation:

Discs

$$\pi \int (r(x))^2 \, dx$$

Washers

$$\pi \int [(R(x))^2 - (r(x))^2] \, dx$$

Shells

$$2\pi \int x f(x) \, dx$$

Fundamental Theorem Of Calculus!!!

If $f'(x)$ is continuous from a to b then:

$$\int_a^b f'(x)dx = f(b) - f(a)$$

If $f(x)$ is continuous from a to b then:

$$\frac{d}{dx}\int_a^x f(t)dt = f(x)$$

Chain Rule

$$\frac{dy}{dx} = \frac{dy}{dv} \bullet \frac{dv}{dx} \quad \text{or} \quad \frac{d}{dx} f(g(x)) = f'(g(x)) \bullet g'(x)$$

Graphing Tips

$\lim_{x \to \pm\infty} f(x) = c \quad \Rightarrow$ *Horizontal Asymptote at* $y = c$

$\lim_{x \to \pm\infty} f(x) = cx \quad \Rightarrow$ *Slant Asymptote with slope* c

f(undefined value) = $\frac{c}{0}$ $\Rightarrow$ *Verticle Asymptote*

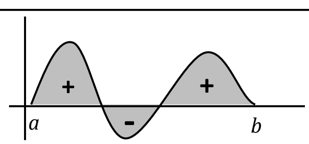
f′(undefined value) = $\frac{0}{0}$ $\Rightarrow$ *Hole in the graph*

y' = slope $\Rightarrow$ +↗ ↔0 ↘-

y'' = concavity $\Rightarrow$ ∪ + , 0 , ∩ -

y′ = 0 or Ø ⇒ Indicates possible Max or Min

y′′ = 0 or Ø ⇒ Indicates possible Inflection Point



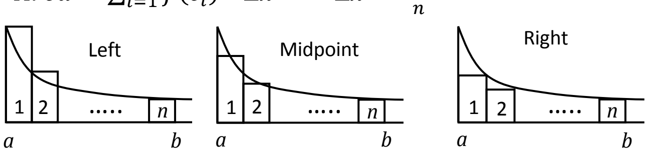
Net change = $\int_a^b f(x)dx$

Trapezoid Rule: (n is the number of trapezoids)

$$\int_a^b f(x)dx \approx \frac{b-a}{2n}(f(x_0) + 2f(x_1) + 2f(x_2) + \cdots + f(x_n))$$

Approximate Area Between *a* and *b* Using Rectangles of Equal Width

$$Area = \sum_{i=1}^{n} f(c_i) \bullet \Delta x \qquad \Delta x = \frac{b-a}{n}$$



$c_i = a + (i-1) \bullet \Delta x \qquad c_i = a + (i - \frac{1}{2}) \bullet \Delta x \qquad c_i = a + i \bullet \Delta x$

$\frac{d}{dx}(ax^n) = nax^{n-1}$

$\frac{d}{dx}(uv) = u'v + uv'$

$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{u'v - uv'}{v^2}$

$\frac{d}{dx}(e^x) = e^x$

$\frac{d}{dx}(b^x) = b^x \ln b$

$\frac{d}{dx}(\ln|x|) = \frac{1}{x}$

$\frac{d}{dx}(\sin x) = \cos x$

$\frac{d}{dx}(\cos x) = -\sin x$

$\frac{d}{dx}(\tan x) = \sec^2 x$

$\frac{d}{dx}(\cot x) = -\csc^2 x$

$\frac{d}{dx}(\sec x) = \sec x \tan x$

$\frac{d}{dx}(\csc x) = -\csc x \cot x$

$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$

$\frac{d}{dx}(\cos^{-1} x) = \frac{-1}{\sqrt{1-x^2}}$

$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$

$\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$

$\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$

$\frac{d}{dx}(\csc^{-1} x) = \frac{-1}{x\sqrt{x^2-1}}$

$\int x^n \, dx = \frac{x^{n+1}}{n+1} + c$

$\int e^x \, dx = e^x + c$

$\int b^x \, dx = \frac{b^x}{\ln b} + c$

$\int \frac{1}{x} \, dx = \ln|x| + c$

$\int \sin x \, dx = -\cos x + c$

$\int \cos x \, dx = \sin x + c$

$\int \tan x \, dx = \ln|\sec x| + c$

$\int \cot x \, dx = \ln|\sin x| + c$

$\int \sec x \, dx = \ln|\sec x + \tan x| + c$

$\int \csc x \, dx = \ln|\csc x - \cot x| + c$

$\int \sec^2 x \, dx = \tan x + c$

$\int \csc^2 x \, dx = -\cot x + c$

$\int \sec x \tan x \, dx = \sec x + c$

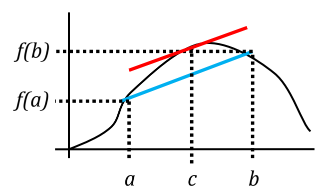
$\int \csc x \cot x \, dx = -\csc x + c$

$\int \frac{1}{\sqrt{a^2-x^2}} \, dx = \sin^{-1}\frac{x}{a} + c, \; a > 0$

$\int \frac{1}{a^2+x^2} \, dx = \frac{1}{a}\tan^{-1}\frac{x}{a} + c$

$\int \frac{1}{x\sqrt{x^2-a^2}} \, dx = \frac{1}{a}\sec^{-1}\frac{x}{a} + c$

If $f(x)$ is continuous and differentiable from a to b, then there is an x-value, c, such that the slope at c is the same as the slope from $(a,f(a))$ to $(b,f(b))$.



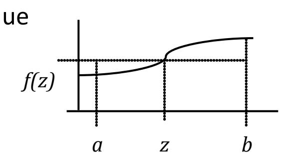
The Mean Value Theorem

$$f'(c) = \frac{f(b)-f(a)}{b-a}$$

From a to b on a continuous $f(x)$ there is a z such that:

- At z, $f(x)$ takes on the average value
- $f(z)$ is the average value

Average Value: $f(z) = \frac{\int_a^b f(x)dx}{b-a}$



Separable Differential Equations---Exponential Growth

When y is directly proportional to the rate at which y changes: $\Rightarrow \frac{dy}{dx} = ry$

$\Rightarrow \frac{1}{y}dy = r\,dt \quad \Rightarrow \int \frac{1}{y}dy = \int r\,dt \quad \Rightarrow \ln y = rt + c$

$\Rightarrow e^{\ln y} = e^{rt+c} \quad \Rightarrow \quad y = e^{rt} \bullet e^c \quad \Rightarrow \quad \boxed{y = pe^{rt}}$