Limit, derivative, integral, convergence, theorems

Question:

Practice by calculating all the limits, all the derivatives, all the integrals.

Derivative

Question:

When does derivative not exist?

Application of integral

Question:

Calculate volume of cylinder, using integral.

Question:

Calculate volume of cone, using integral.

Theorems of calculus

Mean value theorem

a < c < b

en.wikipedia.org/wiki/Mean\_value\_theorem

Rolle theorem

mathworld.wolfram.com/RollesTheorem.html

Question:

Explain Rolle theorem.

Farmat theorem

**Fermat's theorem** (also known as **interior extremum theorem**) is a method to find local [maxima and minima](https://en.wikipedia.org/wiki/Maxima_and_minima) of [differentiable functions](https://en.wikipedia.org/wiki/Differentiable_function) on [open sets](https://en.wikipedia.org/wiki/Open_sets) by showing that every local [extremum](https://en.wikipedia.org/wiki/Maxima_and_minima) of the [function](https://en.wikipedia.org/wiki/Function_%28mathematics%29) is a [stationary point](https://en.wikipedia.org/wiki/Stationary_point) (the function's [derivative](https://en.wikipedia.org/wiki/Derivative) is zero at that point). Fermat's theorem is a [theorem](https://en.wikipedia.org/wiki/Theorem) in [real analysis](https://en.wikipedia.org/wiki/Real_analysis), named after [Pierre de Fermat](https://en.wikipedia.org/wiki/Pierre_de_Fermat).

en.wikipedia.org/wiki/Fermat%27s\_theorem\_(stationary\_points)#:~:text=Fermat%27s%20theorem%20is%20central%20to,this%20set%20to%20determine%20the

Question:

Explain Fermat theorem.

Application of derivative

Projectile

Question:

Check correctness of minimal velocity of projectile for x = 10, y =0, g = 10, then Vmin must be 10 and angle of release A must be 45 degrees.

‘ (1+x^2)/(ax-b)

‘ derivative-calculator.net

' minimum velocity for projectile

x = 10

y = 0

g = 10

T1 = (y + Sqr(x \* x + y \* y)) / x

T2 = (y - Sqr(x \* x + y \* y)) / x

'MsgBox T1

'MsgBox T2

'MsgBox x \* T1 - y

v1 = Sqr(g \* x ^ 2 \* (1 + T1 ^ 2) / (2 \* (x \* T1 - y)))

MsgBox v1

'v2 = Sqr(g \* x ^ 2 \* (1 + T2 ^ 2) / (2 \* (x \* T2 - y)))

'MsgBox v2

MsgBox Atn(T1) \* 180 / (4 \* Atn(1))

'MsgBox Atn(T2) \* 180 / (4 \* Atn(1))

Question:

Calculate curvature of y = f(x) = Tx2 + Lx + m7

Convergence tests

For improper integrals

First kind

 converges if p < -1,

Second kind

 converges if p > -1

Question:

Does this first order improper integral converge or diverge? Why?

Question:

Does this second order improper integral converge or diverge? Why?

For series

 converges if p < -1

Question:

Does this series converge or diverge? Why?

Inequalities

Solve the inequalities.

m2 = 0: |k - Tx| < s

m2 = 1: |-s + Lx| - |kx + T| < s

http://www.wolframalpha.com

Linear programming

**Linear programming** (**LP**), also called **linear optimization**, is a method to achieve the best outcome (such as maximum profit or lowest cost) in a [mathematical model](https://en.wikipedia.org/wiki/Mathematical_model) whose requirements are represented by [linear relationships](https://en.wikipedia.org/wiki/Linear_function#As_a_polynomial_function). Linear programming is a special case of mathematical programming (also known as [mathematical optimization](https://en.wikipedia.org/wiki/Mathematical_optimization)).

en.wikipedia.org/wiki/Linear\_programming

youtube.com/watch?v=-32jcGMpD2Q

youtube.com/watch?v=Uo6aRV-mbeg

Question:

Explain Bernoulli principle.