19 July 2018 individual task in calculus:

Edited at 8am 19.7.2018.

1. Solve the differential equation Ty'' + my' + Ly = cos(kx), y(0) = 0, y'(0) = 1.

https://www.emathhelp.net/calculators/differential-equations/differential-equation-calculator/?i=67\*y%27%27%2B+32\*y%27+%2B+11\*y%3Dcos%289000\*x%29%2C+y%280%29%3D0%2C+y%27%280%29%3D1

1.2. Solve the linear and non-linear real projectile problems for A = T degrees, V = T, R = 1/T.

Linear:

Going up:

x'' + Rx' = 0

y'' + Ry' = -g

Going down:

x'' + Rx' = 0

y'' - Ry' = -g

https://www.grc.nasa.gov/www/k-12/airplane/flteqs.html

http://farside.ph.utexas.edu/teaching/336k/Newtonhtml/node29.html

Non-linear:

Going up:

x'' + R(x')2 = 0

y'' + R(y')2 = -g

Going down:

x'' + R(x')2 = 0

y'' - R(y')2 = -g

g = 10

x(t)

y(t)

t = time

R = Drag

x(0) = 0

x'(0) = Vcos(A)

y(0) = 0

y'(0) = Vsin(A)

Check if Vsin(A) > 1/T. Explain.

How can you assess the solution for drag R if you have solution for case R = 0?

http://www.wolframalpha.com/widgets/view.jsp?id=e602dcdecb1843943960b5197efd3f2a

https://www.emathhelp.net/calculators/differential-equations/differential-equation-calculator/?i=y%27%27%2B+0.01\*y%27%3D-10%2C+y%280%29%3D0%2C+y%27%280%29%3D1

2. Determine the type of the partial differential equation.

m2 = 0: -6Hxx + 7Hxt – 5Htt +675Hx – 34Ht + 54356 = 0

m2 = 1: 39Hxx + 23Hxt – 305Htt - 6567Hx +56465Ht - 67467 = 0

2.2. Calculate

m3 = 0: curl(grad)

m3 = 1: div(curl)

m3 = 2: div(grad)

3. Heaviside method:

L1 = L

m1 = m

n1 = s

a1 = a

b1 = T

c1 = e

Calculate the integral of the function f(x).

3.2. Explain the formulas and their errors:

m4 = 0: Left and right rectangles

m4 = 1: Mid-rectangles

m4 = 2: Trapezoidal rule

m4 = 3: Simpson rule

4. Find the improper integrals.

5. Calculate Riemann sum for the integral.

for T intervals.

6. Find T! and T-th Fibonacci number.

http://mathworld.wolfram.com/GammaFunction.html

https://en.wikipedia.org/wiki/Fibonacci\_number

7. Calculate using linear approximation.

8. Give the series convergence tests.

m3 = 0: ratio

m3 = 1: root

m3 = 2: integral

9. Do errors analysis for the linear, quadratic, and cubic approximations of (1+1/T)6.

10. Perform the errors analysis for the integral error bounds of x6 @[0, 1] taking 2T intervals.

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/error4bounds4integration.docx

11. Plot the graphs in polar coordinates and parametric curves.

m4 = 0: R = Acos(A)

m4 = 1: R = Asin(A)

m4 = 2: x = cos(t)sin(t), y = cos(t)

m4 = 3: x = Sin(t), y = tCos(t)

11.2. How many petals are there in the flower R = cos(TA)?

12. Prove the Jacobian expression.

m3 = 0: Polar coordinates.

m3 = 1: Cylindrical coordinates.

m3 = 2: Spherical coordinates.

13. Find the properties of the elliptic curve. y2 = x3 + Lx + T.

Calculate the discriminant of the elliptic curve.

Give x for y = 0 at your elliptic curve.

14. Calculate the complex numbers.

m3 = 0: (a+ei) – (u – ki)

m3 = 1: (a+ei)(L – ki)

m3 = 2: (a+ei)/(m – ki)

15. Give the best fit.

Do least squares exponential regression.

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/exponentialleastsquaresfit3.txt

http://mathworld.wolfram.com/LeastSquaresFittingExponential.html

https://en.wikipedia.org/wiki/List\_of\_countries\_by\_future\_population\_(United\_Nations,\_low\_fertility\_variant)

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/3valuesleastsquareslinearregression.txt

16. Find the errors.

17. Improve your project.