**4 calculus individual task:**

Edited at 4pm 20.6.2017.

s is your student number. k = s mod 10000. T = s mod 100. m = s mod 35. a = s mod 25.

L = s mod 10. . e = s mod 8. m7 = s mod 7. m6 = s mod 6. m5 = s mod 5. m4 = s mod 4.

m3 = s mod 3. m2 = s mod 2. u = s + 10000.

Cartesian coordinates:

1. Are the points collinear?

(a,m),(L,T),(s,a)

2. Are the points collinear?

(a,m,T),(L,T,m),(s,L,a)

3. Are the points coplanar?

(a,m,T),(L,T,m),(s,L,a),(m,a,T)

Integrals:

4. Calculate

5. Find

Differential equations:

Euler method:

6. Solve y´ = y/T, y(0) = 1/k using m2 + 2 unitary steps.

Calculate error at every point.

Partial differential equations:

7. Solve:

m2 = 0: the Heat Transfer Equation:

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/heat6equation6scanned.jpg

https://en.wikipedia.org/wiki/Heat\_equation

m2 = 1: Maxwell’s Equations:

https://en.wikipedia.org/wiki/Maxwell%27s\_equations

8. Series and numerical integration.

m6 = 0: Give Taylor series truncation error in Lagrange form.

m6 = 1: Give left rectangles rule formula and integration error bound.

m6 = 2: Give right rectangles rule formula and integration error bound.

m6 = 3: Give mid rectangles rule formula and integration error bound.

m6 = 4: Give trapezoidal rule formula and integration error bound.

m6 = 5: Give Simpson rule formula and integration error bound.

9. Solve y´´ + y´/s + uy = Tsin(kx + e), y(0) = 0, y´(0) = 1.

, **curl** **V** = , div **V** =. , **grad** S =

10.

m5 = 0: Explain Nabla operator.

m5 = 1: Explain divergence.

m5 = 2: Explain curl.

m5 = 3: Explain gradient.

m5 = 4: Explain Maxwell Equations.

11.

m3 = 0: Give example of elliptic partial differential equation.

m3 = 1: Give example of parabolic partial differential equation.

m3 = 2: Give example of hyperbolic partial differential equation.

12. Calculate

m3 = 0: curl(grad)

m3 = 1: div(curl)

m3 = 2: div(grad)

**i**, **j**, **k** are unitary vectors along x, y and z respectively.

13. Find these dot-products:

m4 = 0: ij =

m4 = 1: jj =

m4 = 2: kj =

m4 = 3: ki=

14. Find these cross-products:

m4 = 0: i×j =

m4 = 1: j×j =

m4 = 2: k×j =

m4 = 3: k×i=

Projects:

15. Improve your research paper.

**Deadline: 30.6.2017.**