2 group calculus task:

Edited at 4pm 24.4.2017.

L’Hopital’s Rule:

1. What is L’Hopital’s Rule?

https://en.wikipedia.org/wiki/L%27H%C3%B4pital%27s\_rule

Anti-derivative:

2. Explain anti-derivative.

3. Find these anti-derivatives.

a. x-1.

b. x-88.

c. sin(x)

d. cos(x)

e. tan(x)

Orthogonal polynomials:

4. Find the *10-th* orthogonal polynomials.

Hyperbolic functions:

5. What are cosh, sinh, tanh?

Optimization:

Derive the equations, find all the values and give all the ratios for these optimization problems:

6. Given the perimeter P = *2* meters, find the maximum areas of the rectangle, the right angled triangle and any triangle.

Find the sides and the ratios of all sides of the rectangle and the triangles.

7. Given the surface area S = *6* squared meters, find the maximum volume of the cylinder and the cone (with lid and with no lid).

Find R, H and the ratios of R/H for all cases.

8. Solve optimization problem for the cuboid of surface area = 6 square meters. Maximize the volume.

Complex numbers:

9. Give expressions for sum, difference, product, quotient, power and root of complex numbers.

10. Calculate.

a. 5 + 2i – 2 + 7i = . . .

b. (2i – 9)(4 + 7i) = . . .

c. (2i + 9)÷(4 + 7i) = . . .

d. (2i + 9)9 = . . .

e. 10.125 = . . .

Differential equations:

11. Solve the differential equation.

y'' + y' + y = cos(x)

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

**Normal Distribution:**

12. Calculate for the normal distribution density function *f(x)*.

**Least squares regression:**

13. Perform the linear least squares fitting of these points (0, 0), (1, 0) and (0, 1). Use vertical offsets and the fitting line in the form y(x) = gx + i. Find the Hessian. Prove the minimum.

Check if for any 3 points (x1,y1), (x2,y2), (x3,y3), which are not on the same straight line,

.

Find the correlation.

Write the expressions for any number of points.

**Correlation:**

14. Find the correlation coefficient for these points.

(5, 8), (2, 3), (6, 4), (1, 7)

Series:

15. Explain series convergence tests.

https://en.wikipedia.org/wiki/Convergence\_tests

Deadline: 30.4.2017 Sunday.