**2016 Calculus 2 final online exam:**

Edited at 6pm 22.7.2016.

*n* is the student number. *k* = *n* mod 10000. *T* = *n* mod 100. *m* = *n* mod 35. a = *n* mod 25. *L* = *n* mod 10.

$d\_{2}=\frac{T-L}{10}$. *m3* = *n* mod 3. *m4* = *n* mod 4. Each question is the same number of marks.

1.I. Find the collinearity and coplanarity of the sets of the points and the vectors.

1.1.I. Are the points collinear?

(a,m),(L,T),(n,a)

2.1.I. Are the points collinear?

(a,m,T),(L,T,m),(n,L,a)

3.1.I. Are the points coplanar?

(a,m,T),(L,T,m),(n,L,a),(m,a,T)

2.I. Graph the functions.

1.2.I. Draw these graphs in polar coordinates (angle A and radius R).

a. R = mA. b. R = sin(LA). c. R = 1 + sin (TA).

2.2.I. Plot the curve.

x = cos(at)-cos(Tt)sin(mt)

y = sin(mt) – sin(Tt)

z=0

0 t 2π

http://www.math.uri.edu/~bkaskosz/flashmo/parcur/

3.I. Calculate the expressions of the complex numbers.

1.3.I. Calculate: a. i-a b. i-L c. im d. i1/(L+2) e. $\sqrt[L+2]{1}$

f. a – mi + Li – T g. (a – mi)(Ti – L) h. (m – ai)/(Li – T) j. (k – ni)L

p. (a – mi)1/(L+2) q. in u. ik w. iL z. ia

2.3.I. Calculate.

a. $(m – Ti)^{m\_{3}+3}$

b. $\frac{T+im}{a-Li}$

c. $\sqrt[m\_{3}+3]{T+mi}$

d. (T+im)(a-Li)

e. (T+im)+(a-Li)

f. (T+im)-(a-Li)

4.I. Classify the shapes. ax2 + mxy + Ly2 = 1 ax2 + my2 + Lz2 + kx + Ty + nz =1

5.I. Solve the differential equations. (a+1)y´´ + (m+1)y´ = kt

1.II. Check the series convergence using the convergence tests.

a. $\sum\_{c=1}^{\infty }c^{-T}$

b. $\sum\_{c=1}^{\infty }c^{-2T}$

c. $\sum\_{c=1}^{\infty }\left(-T\right)^{-c}$

d. $\sum\_{c=1}^{\infty }\left(Tc\right)^{-1}$

2.II. Give the expression for Normal Distribution with the mean of *m* and the standard deviation of *d2*.

3.II. Perform the linear least squares fitting of these points (*L, a*), (*m, k*) and (*T,* $d\_{2}$).

$$g=\frac{3\left(x\_{1}y\_{1}+x\_{2}y\_{2}+x\_{3}y\_{3}\right)-(x\_{1}+x\_{2}+x\_{3})(y\_{1}+y\_{2}+y\_{3})}{3\left(x\_{1}^{2}+x\_{2}^{2}+x\_{3}^{2}\right)-(x\_{1}+x\_{2}+x\_{3})^{2}}$$

$i=\frac{y\_{1}+y\_{2}+y\_{3}-g(x\_{1}+x\_{2}+x\_{3})}{3}$.

4.II. Calculate the correlation coefficient for ($d\_{2}$,L),(a,T),(n,m),(k,m).

5.II. Find the equations of the cords.

1.5.II. Find the equation of a massless cord fixed at the height of *T meters* supporting massive bridge of *k meters* in length with the lowest height in the middle of *0.001T meters*.

2.5.II. Find the equation of a massive cord fixed at the height of *T meters* and at the distance of *k meters*.

1.III. Find y in logistic growth for ymin = *a*, ymax = *99(m+1)*, R = *m3*, time x = *m3*.

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

2.III. Given the perimeter P = *T* 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.

3.III. Given the surface area S = *T* 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.

4.III. Solve the integral transformations problems.

Use the integral transformations to solve your own problem.

5.III. Write the equations of the geometrical transformations.

1.5.III. Express the translation *k* units right and *–T* units up.

2.5.III. Give the equations for the enlargement *T* times around the center of the enlargement (*L,a*).

3.5.III. Express the stretch *T* times for the stationary line y = *k*x+*m*.

4.5.III. Give the equations for the rotation around (*L,a*) by *T* dgrees.

5.5.III. Express the reflection with respect to the line y = *k*x+*m*.

1.IV. Expand sin(Tx) in the Taylor Series around 0. Take only terms 0, 1, 2, 3, 4.

2.IV. Expand f(x) = *T* in the Fourier Series. Take only terms 0, 1, 2, 3, 4.

3.IV. Expand sin(*T*x) in Legendre polynomial series. Take only terms 0, 1, 2, 3, 4.

4.IV. Find the *L-th* orthogonal polynomials.

5.IV. Calculate the Inner Product of sin(*a*x) and cos(*m*x) at [0, 1].

6.IV. Draw the fractals. ReC = 1 / n. ImC = 1 / T.

Draw a fractal https://www.wolframalpha.com/input/?i=Julia+set+0.1%2B0.05i

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/draw\_fractal.txt

V. Present your project.

**Deadline: 24.7.2016.**