3 individual task in calculus:

Edited at 8am 21.5.2018.

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.

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

2. Heaviside method:

L1 = L

m1 = m

n1 = s

a1 = a

b1 = T

c1 = e

3. 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

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

4.

m5 = 0: Explain Nabla operator.

m5 = 1: Explain divergence.

m5 = 2: Explain curl.

m5 = 3: Explain gradient.

m5 = 4: Explain Maxwell Equations.

5. 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.

6. Find these dot-products and corresponding cross-products:

m4 = 0: **ij** =

m4 = 1: **jj** =

m4 = 2: **kj** =

m4 = 3: **ki** =

7. Find these cross-products.

m4 = 0: **i×j** =

m4 = 1: **j×j** =

m4 = 2: **k×j** =

m4 = 3: **k×i**=

8. Calculate

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

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

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

**Linear approximation:**

10. Calculate using linear approximation.

11. Calculate Riemann sum for integral

for T intervals.

**Truncation error:**

12. Perform errors analysis for the linear, quadratic, and cubic approximations for (1+1/T)6.

**Error bounds for integration:**

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

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

14. Explain the integration error bounds:

m4 = 0: Left and right rectangles

m4 = 1: Mid-rectangles

m4 = 2: Trapezoidal rule

m4 = 3: Simpson rule

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

16. 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)

17. Prove the Jacobian expression. 4. Solve the optimization problems.

m3 = 0: Polar coordinates.

m3 = 1: Cylindrical coordinates.

m3 = 2: Spherical coordinates.

18.

m4 = 0: Explain curvilinear coordinates.

m4 = 1: What are polar coordinates?

m4 = 2: Explain cylindrical coordinates.

m4 = 3: What are spherical coordinates.

19. Find the discriminant of the elliptic curve y2 = x3 + Lx + T. Give the properties of your elliptic curve. Find x for y = 0 at your elliptic curve.

Optimization or application of derivative:

Analyze the number of layers for the optimal configuration.

20. Find the largest area rectangle with perimeter of T.

21. Find the largest volume cylinder with surface area of T.

22. Find the largest volume cone with surface area of T.

23. Find minimum initial velocity and corresponding angle of release to hit the top corner of soccer goal

(3 – 1/T by 8 – 1/T meters) from penalty spot 11 – 1/T meters from the goal.

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https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/minimum4velocity4projectile4angle.txt

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/velocity4minimum4projectile.txt

**Application of integrals:**

24. Calculate area bellow the curve f(x)=1+cos(Tx)@[1/s,1/k].

25. Calculate area between the curves

f(x)=1+cos(Tx) and g(x)= 1+sin(Tx)@[1/s,1/k].

26. Calculate average value, center of mass and moment of inertia of f(x)=1+cos(Tx)@[1/s,1/k].

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/center\_of\_mass.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/y\_center\_of\_mass.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/curves\_center\_of\_mass.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/moment\_of\_inertia.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/x\_curves\_moment\_of\_inertia.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/y\_curves\_moment\_of\_inertia.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/corrected\_averages\_centers\_massess\_inertia\_moments.jpg

http://www.integral-calculator.com/

27. Find arc length of f(x)

a. -0.006x2+0.3x@[1/s,11-1/k],

b. 1+cos(Tx)@[1/s,1/k],

c. x2@[0,T].

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/arc1.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/arc2.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/arc3.txt

http://www.integral-calculator.com/

28. Calculate revolutionary volume and surface area of

f(x) = 1 + cos(Tx) @ [1/s, 1/k].

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/surface\_of\_revolution.txt

http://www.integral-calculator.com/

Differential equations:

Solve these differential equations:

Ordinary differential equations:

29. y' = Ty

30. Ty'' + my' + Ly = 0

31. Ty'' + my' + Ly = sin(kx + a)

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

32. Solve the differential equation for projectile for angle of release of T degrees and initial velocity of T meters per second.

**Logistic function, Logistic growth, Learning curve:**

33. Calculate logistic function P(t) for i = L+1 and R = t = M = L+2.

34. Find inflection point of your logistic function for

i = L+1 and R = t = M = L+2.

https://www.symbolab.com/solver/function-inflection-points-calculator

https://www.wolframalpha.com/input/?i=inflection+points+e%5Ex%2F(e%5Ex%2B1)

Partial differential equations:

35. Solve heat equation for v = T.

36. Solve wave propagation equation for v = T.

Series:

37. Two computer companies make computers whose power increases: the first computers increase their power 2T% every two years and the second T% every year. Which computer power grows faster? Why?

38. What gives the greater value 0.1T% decay in 2 years or 0.05T % every year? Why?

39. What is the hangover of *s* meter blocks?

40. Calculate

a. b. c.d.e.f.g.h. i.

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/alternating2harmonic2series.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/harmonic4series.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse1power.txt

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse3powers.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse4powers.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse5powers.txt

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse6powers.txt

41. Find

42. Find the convergence radius and the sum.

43. Calculate

44. Expand sin(Tx) in the Taylor Series around 0.

Take only terms 0, 1, 2, 3, 4.

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

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

**Orthogonal polynomials:**

47. Expand sin(*T*x) in Legendre polynomial series.

Take only terms 0, 1, 2, 3, 4.

48. Give the orthogonal polynomials number L.

https://en.wikipedia.org/wiki/Orthogonal\_polynomials

Fractals:

49. Draw fractal.

https://www.wolframalpha.com/examples/math/geometry/fractals/

Predictions:

50. Predict results of soccer world cup and Indonesian elections of 2018.

http://www.fifa.com/worldcup/

https://en.wikipedia.org/wiki/Indonesian\_local\_elections,\_2018

51. Try to apply for all grants, scholarships, fellowships, etc. in embassies of USA, Canada, Europe, Australia, Japan, etc.

Project:

52. Improve your project.

Deadline is 31.5.2018.