Calculus 2 Mid-Term Exam made by Michael in May of 2017.

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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. m4 = s mod 4. m3 = s mod 3.

m2 = s mod 2.

Each problem is the same number of marks.

Number theory:

Complex numbers:

1.1. Calculate the complex numbers expressions.

1.1.1. Calculate: a. i-a b. i-L c. im d. i1/(L+2) e.

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

1.1.2. Find.

a.

b.

c.

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

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

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

Limits:

1.2.3. Calculate a. use L’Hopital’s Rule. b.

Functions:

1.2.4. Explain

m2 = 0: Exponential function

m2 = 1: Logarithmic function

Orthogonal polynomials:

2.1. Give the orthogonal polynomials number L.

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

Correlation:

2.2. Calculate the correlation coefficient for (,L),(a,T),(n,m),(k,m).

Derivatives:

Regression:

3.1. Perform the linear least squares fitting of these points (*L, a*), (*m, k*) and (*T,* ).

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Optimization:

3.2. Solve the optimization problems.

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

3.2.8. 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.

3.2.9. 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.

3.2.10. Solve optimization problem for the cuboid of surface area = T square meters. Maximize the volume.

Shapes:

2-D shapes:

Translation:

4.1. Write the equation of the circumference of radius T with the center at (s, k).

4.1.12. For each equation write ellipse or parabola, or hyperbola.

a. sx -7 –y + kx2 +xy = -0.0006ky2

b. -0.005kx +1 -0.003kxy + 0.0009ky2 +0.008kxy = 0.002kx2

c. -0.00002kxy – ky2 = 0.0007kyx + 6k – 0.00004kx2 – 45k – 4ky + 3kx

4.2. Classify the shapes.

a. ax2 + mxy + Ly2 = 1.

b. ax2 + my2 + Lz2 + kx + Ty + sz =1

5.1. Draw the graphs in polar coordinates.

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

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

https://www.desmos.com/calculator/ms3eghkkgz

5.2. Plot the parametric 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/

Anti-derivative:

6.0. Find the anti-derivatives.

6.0.16. Find these anti-derivatives.

a. x-T.

b. sin(Tx)

c. cos(Tx)

d. tan(Tx)

Integrals:

6.0.17. Explain

m2 = 0: Integration by substitution.

m2 = 1: Integration by parts.

Applications of integrals:

6.1. 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

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

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

6.2. 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/

7. Calculate revolutionary volume and surface area of

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

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

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

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

Differential equations:

8. Solve the differential equations.

8.21. Find y(x) from

a. y´ = Ty.

b. kP´ = TP(k-P), P(0) = T

c. T + y2 + xyy´ = 0.

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/oscillatorydifferentialequationsolution18mar2017.docx

d. ky´´ + Ty´ + Ly = Tsin(x).

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/sindiffeqcalc2mar2017.docx

8.22. Solve: Ty'' + my' + Ly = kx

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/4complex4roots4characteristic4equation.txt

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/formulas4same4real4roots4characteristic4equation.docx

Logistic growth:

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

Series:

9. Check the series convergence using the convergence tests and find the sums.

a.

http://www.wolframalpha.com/widgets/view.jsp?id=86ceba9f35c96ebae137e44a36c7261a

b.

http://www.wolframalpha.com/widgets/view.jsp?id=86ceba9f35c96ebae137e44a36c7261a

c.

https://en.wikipedia.org/wiki/Alternating\_series\_test

d.

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

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

9.27. 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

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/inverse2powers.txt

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

9.28. Find

9.29. Find the convergence radius and the sum.

9.30. Calculate

Project:

10. Improve your project.