UTS in calculus II made by Michael Marchenko in May of 2018

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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. m5 = s mod 5. m4 = s mod 4.

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

Normal and Binomial distributions:

1. Give Normal and Binomial distributions solutions.

1.1. Calculate

1.2. What is Normal distribution?

https://en.wikipedia.org/wiki/Normal\_distribution

1.3. Explain Binomial Distribution.

https://en.wikipedia.org/wiki/Binomial\_distribution

Least squares:

2. Give the least squares best fit for (L,a), (m,T), (k,s).

3. Solve optimization problem.

Optimization or application of derivative:

Geometrical shapes optimization:

3.1. Find the largest area ellipse for a + b = T meters.

3.2. Find the largest area rectangle with perimeter of T meters.

3.3. Find the largest area right-angled triangle with perimeter of T meters.

3.4. Find the largest area scalene triangle with perimeter of T meters.

3.5. Find the largest volume cuboid with surface area of T meters squared.

3.6. Find the largest volume cylinder with surface area of T meters squared.

3.7. Find the largest volume cone with surface area of T meters squared.

Analyze the number of layers for the optimal configuration.

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

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

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

Projectile optimization:

3.11. 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.

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/projectile16.docx

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:**

4. Apply integrals.

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

4.2. Calculate area between the curves

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

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

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/average\_value\_of\_continuous\_function.txt

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/

4.4. 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/

4.5. 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:

5. Solve differential equations.

Projectile differential equation:

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

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

Solve these differential equations:

Ordinary differential equations:

5.2. y' = Ty

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

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

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

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

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

5.6. 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:

5.7. Solve heat equation for v = T.

5.8. Solve wave propagation equation for v = T.

Series:

6. Solve series.

6.1. 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?

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

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

6.4. Calculate

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

http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/pi25percent.txt

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

6.5. Find

6.6. Find the convergence radius and the sum.

6.7. Calculate

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

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

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

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

**Orthogonal polynomials:**

7. Solve orthogonal polynomials.

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

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

7.3. Give the orthogonal polynomials number L.

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

Fractals:

8. Draw fractal.

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

Predictions:

9. Make predictions.

9.1. 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

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

Project:

10. Improve your project.