**Calculus 2 mid-term exam**

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n is your student number.

k = n mod 10000. T = n mod 100. m = n mod 35.

a = n mod 25. L = n mod 10.

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**Integrals:**

I. Solve the integral problem.

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

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

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2.I. Find arc length of f(x) a. -0.006x2+0.3x@[1/n,11-1/k], b.1+cos(Tx)@[1/n,1/k], c.x2@[0,T].

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

3.I. Calculate revolutionary volume and surface area of f(x) = 1 + cos(Tx) @ [1/n, 1/k].

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4.I. Calculate a. b. c. Use 2m+2 intervals.

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/normal\_distribution\_integral\_for\_n.txt

5.I. Assess the integration error bounds for

using 2m+2 intervals for left rectangles, right rectangles, middle rectangles, trapezoidal and Simpson rules.

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**Exponential growth and decay:**

II. Give the solution to the exponential growth and decay problem.

1.II. If I reduce the score 10% every day, what will be the score after T days?

Calculate the result for the instantaneously calculated rate.

2.II. If I invest $100 to a bank at T percent per year interstates, in how many years will I have $200?

Calculate the result for the instantaneously calculated rate.

**Differential equations:**

III. Solve the differential equation problem.

1.III. Solve: ay'' + my' + Ly = kt

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2.III. Solve the soccer projectile problem for d = (11-1/T) meters and h = (2.5-1/k) meters.

You must hit the top corner of the soccer goal with the sizes of 7.5 meters per h meters from the penalty spot of d meters. V is the initial velocity. A is the angle of release. The radius of the soccer ball is 0.1 meters. Neglect air resistance. Consider the ball as a material point at the center of mass of the spherical soccer ball.

Solve the differential equations. Find the arbitrary constants from the boundary conditions or initial conditions.

Find the shortest possible time to hit the top corner of the soccer goal with the initial velocity V = 30m/s.

Find the minimum V and the corresponding to it A.

Find the minimum V and A of the direct kick, when the ball is never above the target.

Find the length of the path of the soccer ball and average velocity.

Find the minimum initial velocity of release for the direct hit and the corresponding angle of release. Is the smallest possible velocity enough for the direct hit?

What shot is the most difficult to save, why?

Would V = *a* meters per second be enough to reach the target? If yes, then find the corresponding A and the time of the motion.

Would V = *a* meters per second be enough for the direct kick? If yes, then find the corresponding A and the time of the motion.

Would A = *T* degrees allow to reach the target? If yes, then find the corresponding V and the time of the motion.

Would A = *T* degrees allow the direct kick? If yes, then find the corresponding V and the time of the motion.

https://en.wikipedia.org/wiki/Direct\_fire

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http://physics15.weebly.com/uploads/3/0/2/7/30272185/code4projectile.txt

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3.III. Solve the Badminton Projectile Problem:

You hit the shuttle from the distance d = (2 – 1/k) meters at the height h = (1 – 1/n) meters and the shuttle must hit the ground on the other side of the net (1.5m in height) as quickly as possible or as close to the net as possible. Neglect the air resistance. The size of the shuttle is 6cm, consider the shuttle as a sphere, as a material point in its center of mass. What are the best angles of release A for the closest fall, for the quickest fall, if V=6m/s? How different are the distances and the times? What is the smallest initial velocity V and the corresponding A? Find the length of the path of the badminton shuttle and the average velocity. What shot is the most difficult to save, why? Find the minimum initial velocity of release for the direct hit and the corresponding angle of release. Is the smallest possible velocity enough for the direct hit? This is similar to what happens during the badminton serve.

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/more4badminton-code.txt

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http://calculus12s.weebly.com/uploads/2/5/3/9/25393482/badminton-minimum-velocity.txt

**Series:**

IV. Solve the series problem.

1.IV. What is the hangover of *n* meter blocks?

2.IV. Calculate

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

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

3.IV. Find

4.IV. Find the convergence radius and the sum.

5.IV. Calculate

**Project:**

V. Describe your project.