Task 1 in calculus:

Study materials:

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/ii1calc2023.docx

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/ii2calc2pres2023.docx

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/ii3calc2023.docx

Instructions:

Write all your answers in this Word Document and email the Word Document with your answers to me.

Try to write only text. Try to avoid pictures, videos and other things, which make files big.

Write your name(s)

Write your student number(s)

s is your student number.

k = s mod 10000 = m10000

T = s mod 100 = m100

m = s mod 35 = m35

a = s mod 25 = m25

L = s mod 10 = m10

m9 = s mod 9

e = s mod 8 = m8

m7 = s mod 7

m6 = s mod 6

m5 = s mod 5

m4 = s mod 4.

m3 = s mod 3

m2 = s mod 2

Questions:

1. Solve number puzzle for 3 + m8 digits.

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/codesums0-9.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1-8code1-8sums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/0-6codesums.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/1dx4de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/2dx3de5dnumberpuzzle.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-9numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-8numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-5numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-4numberpuzzles.txt

2. Find approximation of e number.

Calculate (1+1/T)T.

s = 19107016

T = s Mod 100

MsgBox (1 + 1 / T) ^ T

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/e\_approximation2019oct.txt

3. Calculate the half-life.

For what x is eLx = 0.5?

s = 33107023

L = s Mod 10

x = Log(0.5) / L

MsgBox x

4. Write equation of line perpendicular to y = Tx + L.

5. Illustrate definition of limit using ε – δ language.

. f(x) = Tx + k. For any ε find δ, using ε – δ definition of the limit.

6. When does limit exist?

https://brilliant.org/wiki/when-does-a-limit-exist/

https://en.wikipedia.org/wiki/Limit\_of\_a\_function

7. List indeterminate forms.

https://en.wikipedia.org/wiki/Indeterminate\_form

8. Calculate these limits for your s.

m4 = 0: Use L’Hopital rule to prove First Great Limit of Calculus:

m4 = 1:

m4 = 2:

m4 = 3:

symbolab.com/solver/limit-calculator

9. Investigate continuity of the function:

m7 = 0: x

m7 = 1:

m7 = 2:

m7 = 3:

m7 = 4:

m7 = 5:

m7 = 6:

symbolab.com/solver/function-continuity-calculator

10. Prove expression for derivative of x2 using limit.

11. Find derivatives of these functions:

m4 = 0: ex

m4 = 1: xp

m4 = 2: cos(x)

m4 = 3:

https://www.derivative-calculator.net/

12. Calculate derivative, using Chain Rule for sin(Tx)

13. Calculate the differential.

m4 = 0: d(f+g) =

m4 = 1: d(f-g) =

m4 = 2: d(fg) =

m4 = 3: d(f/g) =

14. Increasing or decreasing:

m5 = 0. -6x

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/-6x.docx

m5 = 1. 9x

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

m5 = 2. sin(x)

m5 = 3. cos(x)

m5 = 4. tan(x)

https://www.derivative-calculator.net/

15. Find min and MAX.

Find the largest area rectangle with perimeter of T meters.

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

Find maximum volume cylinder for surface area of T meters square.

Find maximum volume cone for surface area of T meters square.

Find maximum area scalene triangle with perimeter of T meters.

16. Concave or convex:

m4 = 0: x3

m4 = 1: -x3

m4 = 2: cos(x)

m4 = 3: sin(x)

17. Find inflection point:

m4 = 0: x3

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

m4 = 1: -x3

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

m4 = 2: cos(x)

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

m4 = 3: sin(x)

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

18. Find linear least-square approximation for your dataset.

(2, m2), (3, m3), (4, m4)

19. Predict population of Indonesia in the year 2200.

20. Find partial derivatives.

m2 = 0: x + y

m2 = 1: xy

21. Calculate total derivative.

m2 = 0: x + y

m2 = 1: xy

22. Find implicit function derivative. Lx2 + Ty2 – k = 0

23. Calculate inverse function derivative y = Tx + L.

24. Calculate:

a. =

= 1 if is a rational number, = 0 if is an irrational number.

b. =

= 0 if is a rational number, = 1 if is an irrational number.

c. =

d.

e. =

f.

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

wolframalpha.com

25. Integrate.

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

wolframalpha.com

26. Do integration by substitution sin(Tx).

27. Do integration by parts.

 =

28. Find using Heaviside method.

L1 = L = m10

m1 = m = m35

n1 = s

a1 = a = m25

b1 = T

c1 = e = m8

integral-calculator.com

wolframalpha.com

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/heaviside\_cover-up\_method\_14jan2019.txt

29. Find:

a.

b.

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

wolframalpha.com

30. Calculate the inner product.

sin(2x)cos(2x) from 1/19107012 to 1/7012

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

wolframalpha.com

31. Calculate Riemann sum for integral

for T intervals.

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/p2integration2vs2summation.docx

32. Calculate this integral:

sin(x)/x from 1/12 to 1

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

wolframalpha.com

33. Calculate

34. Find

35. Calculate a. b. Use 2T nodes.

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/simpson-rule-numerical-integration-method.txt

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

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/simpson-rule-numerical-integration-method.txt

37. Find multiple integral of F = xy = z, 0 < x < T, 0 < y < k.

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

f(x)=1+cos(Tx)

a = 1/s

b = 1/k

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

wolframalpha.com

39. Calculate area between the curves

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

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

wolframalpha.com

40. 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/

wolframalpha.com

41. 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/

wolframalpha.com

42. 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/

wolframalpha.com

43. Solve these differential equations:

y' = y using Euler method for m2 + 2 unitary steps.

y(0) = 1.

h=1

y' = Ty

44. 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

s = 19107012

m2 = s Mod 2

If m2 = 0 Then A = -6: B = 7: C = -5

If m2 = 1 Then A = 39: B = 23: C = -305

D = B ^ 2 - 4 \* A \* C

If D < 0 Then MsgBox "elliptic"

If D = 0 Then MsgBox "parabolic"

If D > 0 Then MsgBox "hyperbolic"

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

x^(5)e^(-x) from 0 to infinity

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

wolframalpha.com

46. 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

wolframalpha.com

47. Find

48. Calculate π for T terms.

n = 15108097

T = n Mod 100

s = 0

For c = 1 To T

s = s + c ^ (-2)

Next c

pi=sqr(6\*s)

‘MsgBox s

MsgBox pi

49. Expand (a + b)L. L = m10.

 1

 1 1

 1 2 1

 1 3 3 1

 1 4 6 4 1

 1 5 10 10 5 1

 1 6 15 20 15 6 1

 1 7 21 35 35 21 7 1

 1 8 28 56 70 56 28 8 1

1 9 36 84 126 126 84 36 9 1

50. Find the convergence radius and the sum.

51. Calculate

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

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

53. Calculate using linear approximation.

54. Give truncation error for T terms of Taylor series for f(x).

55. Expand Tx in the Fourier Series.

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

12\*x\*sin(x)/pi from –π to π

12\*x\*sin(2x)/pi from –π to π

12\*x\*sin(3x)/pi from –π to π

12\*x\*sin(4x)/pi from –π to π

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

wolframalpha.com

56. Find mean, median and mode of m2, m3, m4, and m5.

57. Calculate correlation between s and date of birth.

58. Find linear regression of s and date of birth.

59. Compare correlation and regression.

60. What is probability of randomly writing T letters?

61. What is probability of randomly writing T decimal digits?

62. Analyze normal distribution curve. Find its inflection point.

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

Calculate N(s).

e^(-x^2)/sqrt(pi)

from – infinity to 19107012

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

wolframalpha.com

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

63. What is Cauchy distribution?

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

Why is (π(1 + x2))-1 important? Find its inflection point.

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

Calculate C(s).

((1+x^2)pi)^(-1)

from – infinity to 19107012

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

wolframalpha.com

64. Compare normal distribution and Cauchy distribution.

65. If you toss T fair coins, then what is the most likely number of heads? Why?

66. Calculate limits of these functions when x goes to zero:

x

1/x

Sin(x)

Cos(x)

Tan(x)

Cot(x)

Log(x)

symbolab.com/solver/limit-calculator

67. Calculate derivatives and integrals of these functions:

x

1/x

Sin(x)

Cos(x)

Tan(x)

Cot(x)

Log(x)

derivative-calculator.net

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

68. Calculate volume of cylinder and cone, using integral.

69. Calculate curvature of y = f(x) = Tx2 + Lx + m7

70. Does this first kind improper integral converge or diverge? Why?

71. Does this second kind improper integral converge or diverge? Why?

72. Does this series converge or diverge? Why?

73. Solve the inequalities.

m2 = 0: |k - Tx| < s

m2 = 1: |-s + Lx| - |kx + T| < s

http://www.wolframalpha.com

74. Solve the inequality

x < y

http://www.wolframalpha.com

75. Find volume and surface area of sphere with radius T.

s = 19107012

L = s Mod 10

T = s Mod 100

k = s Mod 10000

E = s Mod 8

q = s Mod 17

A = s Mod 25

d = (T - L) / 10

Pi = 4 \* Atn(1)

R = T

volume = 4 \* Pi \* R ^ 3 / 3

SurfaceArea = 4 \* Pi \* R ^ 2

MsgBox volume

MsgBox SurfaceArea

76. For what x is eLx = 0.5?

s = 19107012

L = s Mod 10

x = Log(0.5) / L

MsgBox x

76. 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?

s = 24123456

T = s Mod 100

c2 = Sqr(1 + 2 \* T \* 0.01)

c1 = 1 + T \* 0.01

c12=(1 + T \* 0.01/2)\*(1 + T \* 0.01/2)

MsgBox c1 - c2

MsgBox c12- c1

m=5

For c = 1 to m

MsgBox (1 + T \* 0.01/c)^c

Next c

Calculate limit

symbolab.com/solver/limit-calculator

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

s = 24123456

T = s Mod 100

c2 = Sqr(1 – 0.1 \* T \* 0.01)

c1 = 1 + 0.05\*T \* 0.01

MsgBox c1 - c2

Calculate limit

symbolab.com/solver/limit-calculator

78. Find relative change for instantaneous change ratio R = -1/T after d2 + 2 days.

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

s = 17108069

T = s Mod 100

L = s Mod 10

d2 = (T - L) / 10

R = -1 / T

x = d2 + 2

MsgBox 1 - Exp(R \* x)

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

s = 18108099

L = s Mod 10

i = L + 1

M\_BIG = L + 2

r = L + 2

t = L + 2

P = M\_BIG \* i \* Exp(r \* t) / (M\_BIG + i \* Exp(r \* t) - 1)

MsgBox P

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/logistic\_function\_code\_26jan2019.txt

https://en.wikipedia.org/wiki/Logistic\_function

80. Classify shape Tx2 + mxy + Ly2 = 1.

s = 19107012

L = s Mod 10

m = s Mod 35

T = s Mod 100

A = T

B = m

C = L

D = B ^ 2 - 4 \* A \* C

If D < 0 Then MsgBox "ellipse"

If D = 0 Then MsgBox "parabola"

If D > 0 Then MsgBox "hyperbola"

81. Find the discriminant of the elliptic curve y2 = x3 + Lx + T.

Here L = m10.

D = -16(4L3 + 27T2)

s = 24123456

L = s Mod 10

T = s Mod 100

a = L

b = T

D = -16 \* (4 \* a \* a \* a + 27 \* b \* b)

MsgBox D