Task 2 in calculus:

Study materials:

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/u3calc2023.docx

https://calculus12s.weebly.com/uploads/2/5/3/9/25393482/u4calc2023.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 the wave propagation equation for the velocity v = T.

2. Solve this equation:

Ty'' + Ly = 0

L = m10

http://www.wolframalpha.com

3. Ty'' + Ly = sin(ωx)

Find resonant ω.

s = 23123456

L = s Mod 10

T = s Mod 100

omega = Sqr(L / T)

MsgBox omega

4. Solve this equation:

Ty'' + my' + Ly = 0

m = m35

L = m10

http://www.wolframalpha.com

5. Solve this equation:

Ty'' + my' + Ly = sin(Tx)

Is there resonance?

m = m35

L = m10

http://www.wolframalpha.com

6. Solve the differential equation Ty'' + my' + Ly = cos(kx), y(0) = 0, y'(0) = 1.

http://www.wolframalpha.com

7. Give equation of T radius circumference in polar coordinates.

8. Give equation of y = Tx in polar coordinates.

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

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

10. Plot 3 + m2 petals flower in polar coordinates.

11. Find perpendicular vector to (T, m, L).

12. Find parallel vector to (T, m, L).

13. Calculate triple product of (T, m, L), (a, s, k), (m7, m9, m17).

s = 23123456

T = s mod 100

m = s mod 35

a = s mod 25

m17 = s mod 17

L = s mod 10

m9=s mod 9

m7=s mod 7

tripleproduct=T\*(s\*m17-k\*m9)-m\*(a\*m17-k\*m7)+L\*(a\*m9-s\*m7)

MsgBox tripleproduct

14. Find dot-product of tensor and vector

a = m25

e = m8

L = m10

m = m35

q = m17

T = m100

Dim t(2, 2), v(2), r(2)

s = 23123456

a = s Mod 25

e = s Mod 8

L = s Mod 10

m = s Mod 35

q = s Mod 17

tt = s Mod 100

t(1, 1) = L

t(1, 2) = tt

t(2, 1) = a

t(2, 2) = m

v(1) = e

v(2) = q

r(1) = t(1, 1) \* v(1) + t(1, 2) \* v(2)

r(2) = t(2, 1) \* v(1) + t(2, 2) \* v(2)

MsgBox r(1)

MsgBox r(2)

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/tensor\_times\_vector2019nov.txt

15.

**R** is the radius-vector on a circumference. Calculate the dot-products and the cross-product.

m3 = 0: **R.R'** =

m3 = 1: **R'.R''** =

m3 = 2: **R×R''** =

16. Calculate

m3 = 0: curl(grad) =

m3 = 1: div(curl) =

m3 = 2: div(grad) =

17. Find these dot-products:

m4 = 0: **ij** =

m4 = 1: **jj** =

m4 = 2: **kj** =

m4 = 3: **ki** =

18. Find these cross-products.

m4 = 0: **i×j** =

m4 = 1: **j×j** =

m4 = 2: **k×j** =

m4 = 3: **k×i**=

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

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

http://www.thermopedia.com/content/918/

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

**sin(56x)/2 from -1 to 1**

**3\*x\*sin(56\*x)/2 from -1 to 1**

**5\*(3\*x^2-1)\*sin(56\*x)/2 from -1 to 1**

**7(5\*x^3-3x)\*sin(56\*x)/2 from -1 to 1**

**9(35\*x^4-30x^2+3)\*sin(56\*x)/2 from -1 to 1**

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

20. 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

n = s

a = m25.

m = m35.

a.

s = 23123456

m2 = s Mod 2

a = s Mod 25

exponent = a Mod 4

If exponent = 0 Then MsgBox "i^(-a) =1"

If exponent = 1 Then MsgBox "i^(-a) =-i"

If exponent = 2 Then MsgBox "i^(-a) =-1"

If exponent = 3 Then MsgBox "i^(-a) =i"

b.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

k = s Mod 10000

n = s

exponent = L Mod 4

If exponent = 0 Then MsgBox "i^(-L) =1"

If exponent = 1 Then MsgBox "i^(-L) =-i"

If exponent = 2 Then MsgBox "i^(-L) =-1"

If exponent = 3 Then MsgBox "i^(-L) =i"

c.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

k = s Mod 10000

n = s

exponent = m Mod 4

If exponent = 0 Then MsgBox "i^m =1"

If exponent = 1 Then MsgBox "i^m =i"

If exponent = 2 Then MsgBox "i^m =-1"

If exponent = 3 Then MsgBox "i^m =-i"

d.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

Pi = 4 \* Atn(1)

x = 0

y = 1

R = Sqr(x ^ 2 + y ^ 2)

alpha = Pi / 2

For c = 0 To L + 1

RealComponent = R ^ 1 / (L + 2) \* Cos((alpha + 2 \* c \* Pi) / (L + 2))

ImaginaryComponent = R ^ 1 / (L + 2) \* Sin((alpha + 2 \* c \* Pi) / (L + 2))

MsgBox "RealComponent"

MsgBox "number"

MsgBox c

MsgBox RealComponent

MsgBox "ImaginaryComponent"

MsgBox "number"

MsgBox c

MsgBox ImaginaryComponent

Next c

e.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

Pi = 4 \* Atn(1)

x = 1

y = 0

R = Sqr(x ^ 2 + y ^ 2)

alpha = Atn(y / x)

For c = 0 To L + 1

RealComponent = R ^ 1 / (L + 2) \* Cos((alpha + 2 \* c \* Pi) / (L + 2))

ImaginaryComponent = R ^ 1 / (L + 2) \* Sin((alpha + 2 \* c \* Pi) / (L + 2))

MsgBox "RealComponent"

MsgBox "number"

MsgBox c

MsgBox RealComponent

MsgBox "ImaginaryComponent"

MsgBox "number"

MsgBox c

MsgBox ImaginaryComponent

Next c

f.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = a

y1 = -m

x2 = -T

y2 = L

RealComponent = x1 + x2

ImaginaryComponent = y1 + y2

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

g.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = a

y1 = -m

x2 = -L

y2 = T

RealComponent = x1 \* x2 - y1 \* y2

ImaginaryComponent = x1 \* y2 + x2 \* y1

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

h.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = m

y1 = -a

x2 = -T

y2 = L

RealComponent = (x1 \* x2 + y1 \* y2)/( x2 ^ 2 + y2 ^ 2)

ImaginaryComponent = (x2\*y1-x1\*y2)/(x2 ^ 2 + y2 ^ 2)

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

j.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x = k

y = -n

R = Sqr(x ^ 2 + y ^ 2)

alpha = Atn(y / x)

RealComponent = R ^ L \* Cos(L \* alpha)

ImaginaryComponent = R ^ L \* Sin(L \* alpha)

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

p.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

Pi = 4 \* Atn(1)

x = a

y = -m

R = Sqr(x ^ 2 + y ^ 2)

alpha = Atn(y / x)

For c = 0 To L + 1

RealComponent = R ^ 1 / (L + 2) \* Cos((alpha + 2 \* c \* Pi) / (L + 2))

ImaginaryComponent = R ^ 1 / (L + 2) \* Sin((alpha + 2 \* c \* Pi) / (L + 2))

MsgBox "RealComponent"

MsgBox "number"

MsgBox c

MsgBox RealComponent

MsgBox "ImaginaryComponent"

MsgBox "number"

MsgBox c

MsgBox ImaginaryComponent

Next c

q.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

k = s Mod 10000

n = s

exponent = n Mod 4

If exponent = 0 Then MsgBox "i^n =1"

If exponent = 1 Then MsgBox "i^n =i"

If exponent = 2 Then MsgBox "i^n =-1"

If exponent = 3 Then MsgBox "i^n =-i"

u.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

k = s Mod 10000

exponent = k Mod 4

If exponent = 0 Then MsgBox "i^k =1"

If exponent = 1 Then MsgBox "i^k =i"

If exponent = 2 Then MsgBox "i^k =-1"

If exponent = 3 Then MsgBox "i^k =-i"

w.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

exponent = L Mod 4

If exponent = 0 Then MsgBox "i^L =1"

If exponent = 1 Then MsgBox "i^L =i"

If exponent = 2 Then MsgBox "i^L =-1"

If exponent = 3 Then MsgBox "i^L =-i"

z.

s = 23123456

m2 = s Mod 2

a = s Mod 25

exponent = a Mod 4

If exponent = 0 Then MsgBox "i^a =1"

If exponent = 1 Then MsgBox "i^a =i"

If exponent = 2 Then MsgBox "i^a =-1"

If exponent = 3 Then MsgBox "i^a =-i"

21. Find.

a.

b.

c.

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

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

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

L = m10.

a = m25.

m = m35.

T = m100.

a.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

m3 = s mod 3

power = 3+m3

x = m

y = -T

R = Sqr(x ^ 2 + y ^ 2)

alpha = Atn(y / x)

RealComponent = R ^ power \* Cos(power \* alpha)

ImaginaryComponent = R ^ power \* Sin(power \* alpha)

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

b.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = T

y1 = m

x2 = a

y2 = -L

RealComponent = (x1 \* x2 + y1 \* y2)/( x2 ^ 2 + y2 ^ 2)

ImaginaryComponent = (x2\*y1-x1\*y2)/(x2 ^ 2 + y2 ^ 2)

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

c.

s = 23123456

m2 = s Mod 2

m3=s mod 3

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

Pi = 4 \* Atn(1)

RootPower = m3+3

x = T

y = m

R = Sqr(x ^ 2 + y ^ 2)

alpha = Atn(y / x)

For c = 0 To RootPower-1

RealComponent = R ^ 1 / (RootPower) \* Cos((alpha + 2 \* c \* Pi) / (RootPower))

ImaginaryComponent = R ^ 1 / (RootPower) \* Sin((alpha + 2 \* c \* Pi) / (RootPower))

MsgBox "RealComponent"

MsgBox "number"

MsgBox c

MsgBox RealComponent

MsgBox "ImaginaryComponent"

MsgBox "number"

MsgBox c

MsgBox ImaginaryComponent

Next c

d.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = T

y1 = m

x2 = a

y2 = -L

RealComponent = x1 \* x2 - y1 \* y2

ImaginaryComponent = x1 \* y2 + x2 \* y1

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

e.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = T

y1 = m

x2 = a

y2 = -L

RealComponent = x1 + x2

ImaginaryComponent = y1 + y2

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

f.

s = 23123456

m2 = s Mod 2

L = s Mod 10

a = s Mod 25

m = s Mod 35

T = s Mod 100

k = s Mod 10000

n = s

x1 = T

y1 = m

x2 = a

y2 = -L

RealComponent = x1 - x2

ImaginaryComponent = y1 - y2

MsgBox "RealComponent="

MsgBox RealComponent

MsgBox "ImaginaryComponent="

MsgBox ImaginaryComponent

22. How do you use calculus?

23. Round your student number to 7 significant figures.

24. Investigate this function

desmos.com/calculator

25. Prove formular of Euler

26. Compare predictions, using Markov chain, averages, least squares linear fit for (2, m2), (3, m3), (4, m4).

Dim x(3), y(3)

s = 23123456

m = 3

x(1) = 2

x(2) = 3

x(3) = 4

y(1) = s mod 2

y(2) = s mod 3

y(3) = s mod 4

sx = 0

For j = 1 To m

sx = sx + x(j)

Next j

sy = 0

For j = 1 To m

sy = sy + y(j)

Next j

sxy = 0

For j = 1 To m

sxy = sxy + x(j) \* y(j)

Next j

sx2 = 0

For j = 1 To m

sx2 = sx2 + x(j) ^ 2

Next j

g = (m \* sxy - sx \* sy) / (m \* sx2 - sx ^ 2)

i = (sy - g \* sx) / m

‘MsgBox g

‘MsgBox i

MsgBox y(3)

sum =0

For c = 1 to 3

sum = sum + y(c)

Next c

MsgBox sum/3

MsgBox 5\*g+ i

MsgBox s mod 5

27. Is second derivative positive or negative for maximum?

28. Is second derivative positive or negative for minimum?

29. Find minimum

Find the smallest perimeter rectangle with area of T.

Calculate the smallest perimeter right-angled triangle with area of T.

Find minimum surface area cylinder for the volume of T.

Calculate minimum surface area cone for the volume of T.

30. Calculate the smallest perimeter scalene triangle with area of T.

31. Explain the formulas, equations, concepts, laws, theories of the calculus.