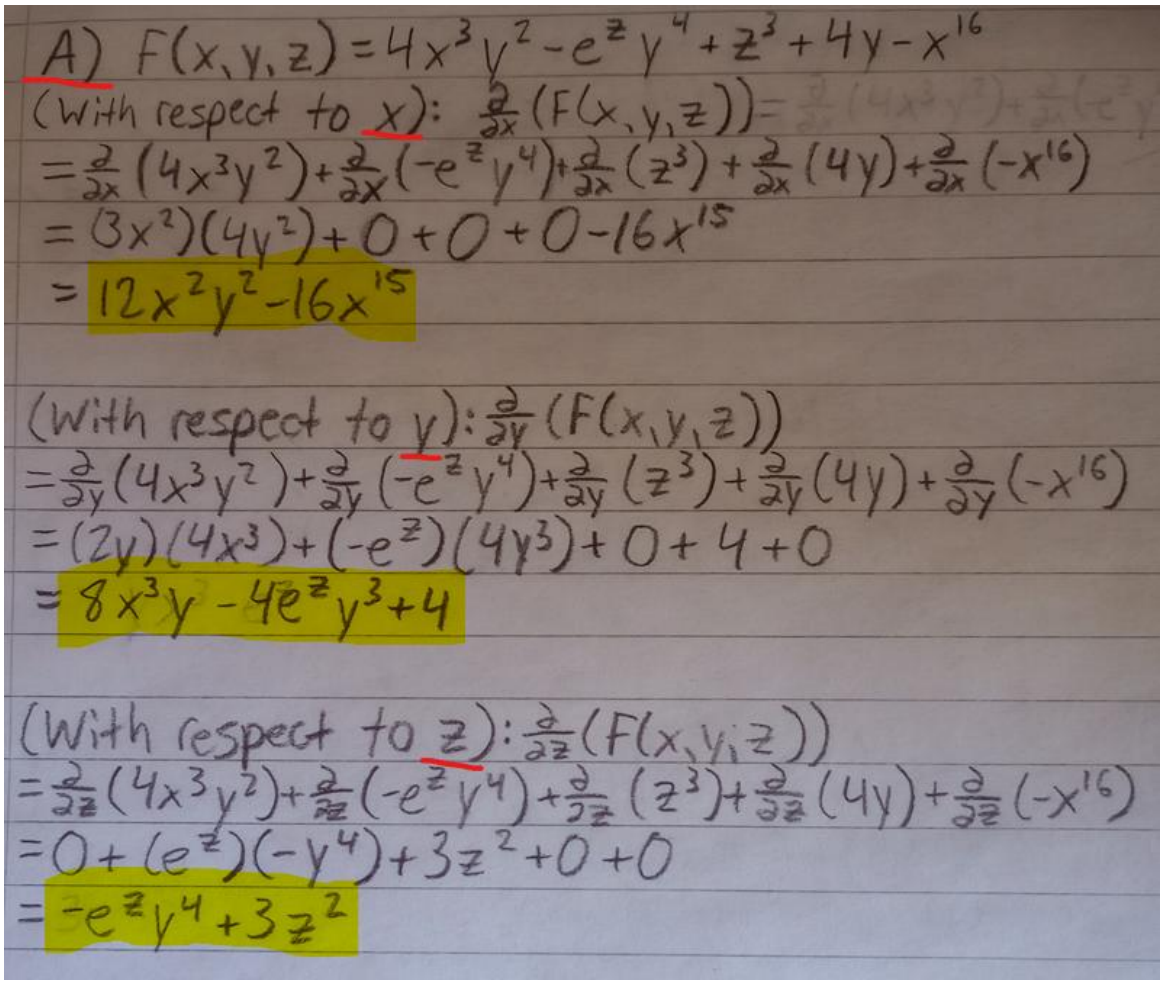
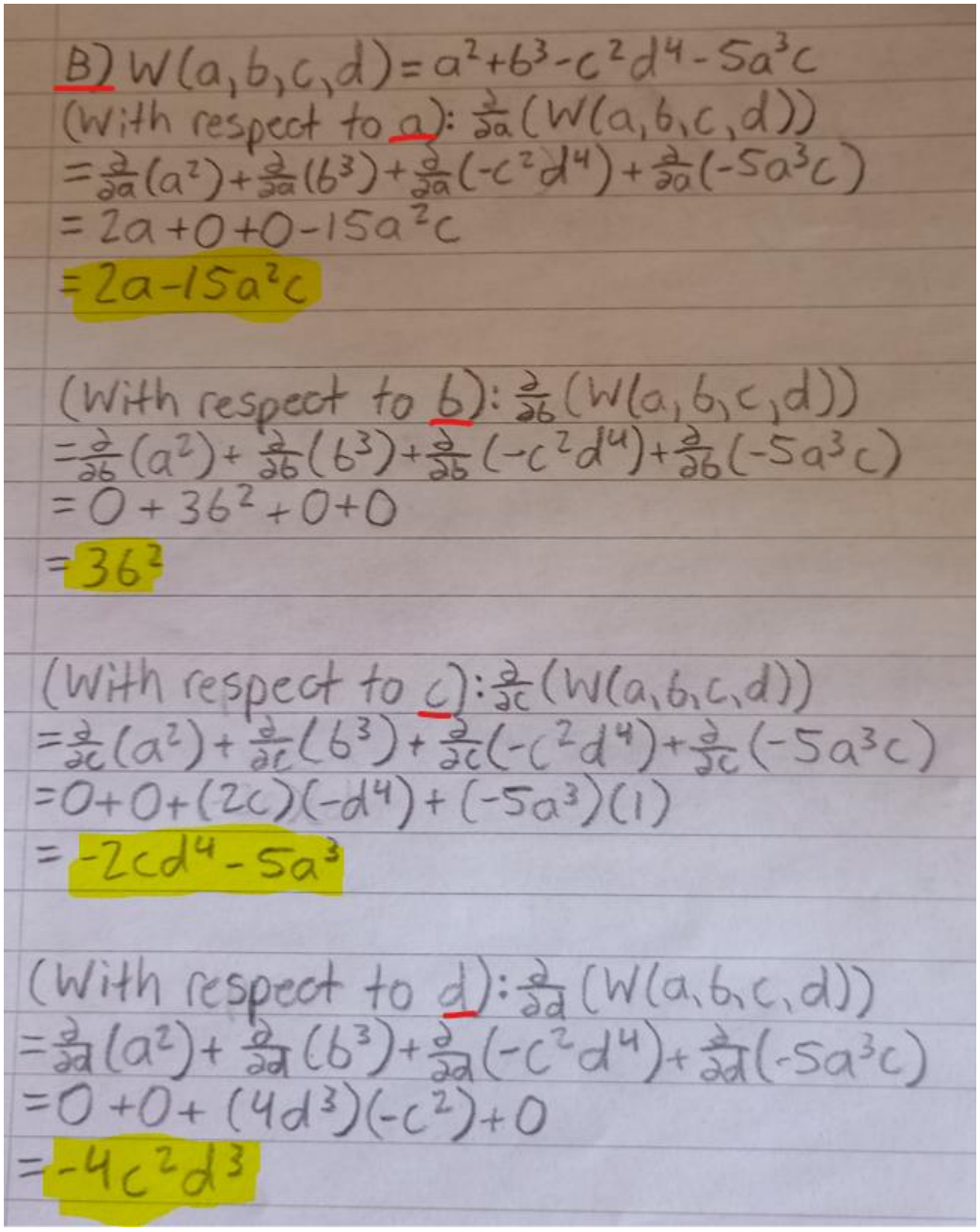
Q.1 Find all the 1st order partial derivatives of the following: **(3 x 2 = 6 points)**

a. $F(x, y, z) = 4x^3y^2 - e^z y^4 + z^3 + 4y - x^{16}$



b. $W(a, b, c, d) = a^2 + b^3 - c^2d^4 - 5a^3c$



Q. 2 For this question, you need to *implement a python code* to compute the partial derivatives of the following:

a. $F(x, y, z) = 2x^3y^2 - e^zy^4z + z^4 + 3yz$

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PS G:\Other computers\Desktop\@College\SCSU Spring 2025\Deep Learning\Assignme
lDerivativeCalc.py
Welcome to the Python partial derivative tool! Press CTRL+C anytime to quit.

=====Function #1=====

How many variables should the program have?
3

Function variables generated! Their names are as follows:
x1
x2
x3

Would you like to rename the variables? (y/n)
y

Please enter the new name for variable x1:
x
Please enter the new name for variable x2:
y
Please enter the new name for variable x3:
z

Function variables renamed! Their new names are as follows:
x
y
z

Please enter the expression for the function you'd like to differentiate.
Note that multiplication MUST be explicit (enter 2*x*y instead of 2xy).
Enter your expression below:
2*x^3*y^2-e^z*y^4*z+z^4+3*y*z

Your final function is: f(x, y, z) = -e^z*y^4*z + 2*x^3*y^2 + 3*y*z + z^4

Partial Derivatives:
With respect to x: 6*x^2*y^2
With respect to y: -4*e^z*y^3*z + 4*x^3*y + 3*z
With respect to z: -e^z*y^4*z*log(e) - e^z*y^4 + 3*y + 4*z^3
```

b. $W(a, b, c, d) = 2a^2b + b^3 - 3c^2d^4 - 5a^3c$

```
=====Function #2=====

How many variables should the program have?
4

Function variables generated! Their names are as follows:
x1
x2
x3
x4

Would you like to rename the variables? (y/n)
y

Please enter the new name for variable x1:
a
Please enter the new name for variable x2:
b
Please enter the new name for variable x3:
c
Please enter the new name for variable x4:
d

Function variables renamed! Their new names are as follows:
a
b
c
d

Please enter the expression for the function you'd like to differentiate.
Note that multiplication MUST be explicit (enter 2*x*y instead of 2xy).
Enter your expression below:
2*a^2*b+b^3-3*c^2*d^4-5*a^3*c

Your final function is: f(a, b, c, d) = -5*a^3*c + 2*a^2*b + b^3 - 3*c^2*d^4

Partial Derivatives:
With respect to a: -15*a^2*c + 4*a*b
With respect to b: 2*a^2 + 3*b^2
With respect to c: -5*a^3 - 6*c*d^4
With respect to d: -12*c^2*d^3
```

Your program should perform the following tasks:

a. It should ask the user to input the number of variables/symbols to be used for an expression, e.g., for the first expression, your program should take a value of 3. **(2 points for each expression = 4 points**)

b. Next, your program should ask the user to enter the expression that you want to compute the partial derivative of. You need to make sure the expressions are entered in a right format. For more information, check the python documentation. **(2 points for each expression = 4 points**)

c. You need to attach three snapshots of your python run as following:

   i. Snapshot of program asking the user to enter the number of variables for both expressions. **(1 point for each expression = 2 points**)

   ii. Snapshot of program asking user to enter the mathematical expression (for

each expression). **(1 point for each expression = 2 points**)

iii. Actual computed partial derivatives of both expressions. **(1 point for each expression = 2 points**)

d. Submit your python code file or notebook file to the drop box. **(If python file is missing, a 10 points penalty will be imposed)**