Congratulations! You passed!

Grade received 100% To pass 80% or higher

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1. In this quiz, you will calculate the Hessian for some functions of 2 variables and functions of 3 variables.

1/1 point

For the function $f(x,y)=x^3y+x+2y$, calculate the Hessian matrix $H=egin{bmatrix}\partial_{x,x}f&\partial_{x,y}f\\\partial_{y,x}f&\partial_{y,y}f\end{bmatrix}$

$$egin{array}{ccc} H = egin{bmatrix} 6xy & -3x^2 \ -3x^2 & 0 \end{bmatrix}$$

$$\bigcirc \quad H = \begin{bmatrix} 0 & 3x^2 \\ 3x^2 & 6xy \end{bmatrix}$$

$$\bigcirc \quad H = \begin{bmatrix} 0 & -3x^2 \\ -3x^2 & 6xy \end{bmatrix}$$

✓ Correct

Well done!

2. For the function $f(x,y)=e^x cos(y)$, calculate the Hessian matrix.

$$\bigcirc \quad H = \begin{bmatrix} -e^x cos(y) & -e^x sin(y) \\ -e^x sin(y) & e^x cos(y) \end{bmatrix}$$

$$\bigcirc \quad H = \begin{bmatrix} -e^x cos(y) & e^x sin(y) \\ -e^x sin(y) & -e^x cos(y) \end{bmatrix}$$

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✓ Correct

Well done!

3. For the function $f(x,y)=rac{x^2}{2}+xy+rac{y^2}{2}$, calculate the Hessian matrix.

Notice something interesting when you calculate $\frac{1}{2}[x,y]H \left| egin{matrix} x \\ y \end{matrix} \right|!$

$$\bigcirc_{H} = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$$

$$\bigcirc_{H} = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$$

$$\bigcirc_{H} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

✓ Correct

Well done! Not unlike a previous question with the Jacobian of linear functions, the Hessian can be used to succinctly write a quadratic equation in multiple variables.

For the function $f(x,y,z)=x^2e^{-y}cos(z)$, calculate the Hessian matrix $H=\begin{bmatrix}\partial_{x,x}f&\partial_{x,y}f&\partial_{x,z}f\\\partial_{y,x}f&\partial_{y,y}f&\partial_{y,z}f\\\partial_{z,x}f&\partial_{z,z}f&\partial_{z,z}f\end{bmatrix}$

$$egin{aligned} igoplus_{H} = egin{bmatrix} 2xe^{-y}cos(z) & x^2e^{-y}cos(z) & 2xe^{-y}sin(z) \ 2xe^{-y}cos(z) & x^2e^{-y}cos(z) & x^2xe^{-y}sin(z) \ 2xe^{-y}sin(z) & 2xe^{-y}sin(z) & 2xe^{-y}cos(z) \end{bmatrix} \end{aligned}$$

$$egin{aligned} igoplus_{A} & H = egin{bmatrix} 2xe^{-y}cos(z) & x^2e^{-y}cos(z) & 2xe^{-y}sin(z) \ 2xe^{-y}sin(z) & 2xe^{-y}sin(z) & 2xe^{-y}sin(z) \ 2xe^{-y}sin(z) & 2xe^{-y}sin(z) & 2xe^{-y}cos(z) \end{bmatrix} \ igoplus_{A} & H = egin{bmatrix} 2e^{-y}cos(z) & 2xe^{-y}sin(z) & 2xe^{-y}sin(z) \ 2xe^{-y}sin(z) & x^2e^{-y}cos(z) & x^2e^{-y}cos(z) \end{bmatrix} \ igoplus_{A} & A = egin{bmatrix} 2e^{-y}cos(z) & 2e^{-y}cos(z) & 2e^{-y}cos(z) \end{bmatrix} \ igoplus_{A} & A = egin{bmatrix} 2e^{-y}cos(z) & 2e^{-y}cos(z) & 2e^{-y}cos(z) \end{bmatrix} \ igoplus_{A} & A = egin{bmatrix} 2e^{-y}cos(z) & 2e^{-y}cos(z) & 2e^{-y}cos(z) & 2e^{-y}cos(z) \end{bmatrix} \ igoplus_{A} & A = egin{bmatrix} 2e^{-y}cos(z) & 2e^{-y$$

$$\begin{array}{c} \bullet \\ H = \begin{bmatrix} 2e^{-y}cos(z) & -2xe^{-y}cos(z) & -2xe^{-y}sin(z) \\ -2xe^{-y}cos(z) & x^2e^{-y}cos(z) & x^2e^{-y}sin(z) \\ -2xe^{-y}sin(z) & x^2e^{-y}sin(z) & -x^2e^{-y}cos(z) \end{bmatrix} \\ \bullet \\ H = \begin{bmatrix} 2xe^{-y}cos(z) & -2e^{-y}cos(z) & -2e^{-y}sin(z) \\ -2e^{-y}cos(z) & x^2e^{-y}cos(z) & x^2e^{-y}sin(z) \\ -2x^2e^{-y}sin(z) & x^2e^{-y}sin(z) & -2xe^{-y}cos(z) \end{bmatrix}$$

$$H = egin{bmatrix} -2xe^{-y}cos(z) & -2e^{-y}cos(z) & -2e^{-y}sin(z) \ -2e^{-y}cos(z) & x^2e^{-y}cos(z) & x^2e^{-y}sin(z) \ -2x^2e^{-y}sin(z) & x^2e^{-y}sin(z) & -2xe^{-y}cos(z) \end{pmatrix}$$

✓ Correct

Well done!

5. For the function $f(x,y,z)=xe^y+y^2cos(z)$, calculate the Hessian matrix.

$$egin{aligned} egin{aligned} O \ H = egin{bmatrix} 0 & e^y & 0 \ e^y & xe^y + 2cos(z) & 2ysin(z) \ 0 & 2ysin(z) & y^2cos(z) \end{bmatrix} \end{aligned}$$

$$\bigcirc H = \begin{bmatrix}
0 & e^{y} & 0 \\
e^{y} & xe^{y} + 2cos(z) & 2ysin(z) \\
0 & 2ysin(z) & y^{2}cos(z)
\end{bmatrix}$$

$$\bigcirc H = \begin{bmatrix}
0 & e^{y} & 0 \\
e^{y} & xe^{y} + 2sin(z) & -2ycos(z) \\
0 & -2ycos(z) & -y^{2}sin(z)
\end{bmatrix}$$

$$\blacksquare H = \begin{bmatrix}
0 & e^{y} & 0 \\
e^{y} & xe^{y} + 2cos(z) & -2ysin(z) \\
0 & -2ysin(z) & -y^{2}cos(z)
\end{bmatrix}$$

$$egin{aligned} egin{aligned} egin{aligned} egin{aligned} egin{aligned} egin{aligned} e^y & e^y & 0 \ e^y & xe^y + 2cos(z) & -2ysin(z) \ 0 & -2ysin(z) & -y^2cos(z) \end{aligned} \end{aligned}$$

$$egin{aligned} egin{aligned} egin{aligned} O \ e^y & xe^y + 2sin(z) & 2ycos(z) \ 0 & 2ycos(z) & y^2sin(z) \end{aligned} \end{aligned}$$

✓ Correct

Well done!