For $f(x,y) = x^2y + \frac{3}{4}xy + 10$, calculate the Jacobian row vector J.

- $J = [xy + \frac{3}{4}y + 10, x^2 + \frac{3}{4}xy + 10]$
- $J = [2xy + \frac{3}{4}y, x^2 + \frac{3}{4}x]$

Correct
Well done!

- $J = [xy + \frac{3}{4}y, x^2 + \frac{3}{4}xy]$
- $J = [2xy + \frac{3}{4}y + 10, x^2 + \frac{3}{4}x + 10]$

For $f(x,y) = e^x cos(y) + xe^{3y} - 2$, calculate the Jacobian row vector J.

- $J = [e^x cos(y) + e^{3y}, -e^x sin(y) + 3xe^{3y}]$

Correct
Well done!

- $J = [e^x cos(y) + e^{3y} - 2, -e^x sin(y) + 3xe^{3y} - 2]$
- $J = [e^x cos(y) + e^{3y} - 2, e^x sin(y) + xe^{3y} - 2]$
- $J = [e^x cos(y) + e^{3y}, e^x sin(y) + xe^{3y}]$

For $f(x, y, z) = e^x cos(y) + x^2y^2z^2$, calculate the Jacobian row vector J.

- ( ) $J = [e^x cos(y) + xy^2z^2, -e^x sin(y) + x^2yz^2, x^2y^2z]$
- (x) $J = [e^x cos(y) + 2xy^2z^2, -e^x sin(y) + 2x^2yz^2, 2x^2y^2z]$

Correct

Well done!

- ( ) $J = [e^x cos(y) + 2xy^2z^2, e^x sin(y) + 2x^2yz^2, 2x^2y^2z^2]$
- ( ) $J = [e^x sin(y) + 2xy^2z^2, -e^y sin(x) + 2x^2yz^2, 2x^2y^2z^2]$

For $f(x, y, z) = x^2 + 3e^ye^z + cos(x)sin(z)$, calculate the the Jacobian row vector and evaluate at the point $(0, 0, 0)$.

- ( ) $J(0, 0, 0) = [0, 2, 3]$
- ( ) $J(0, 0, 0) = [3, 0, 2]$
- ( ) $J(0, 0, 0) = [2, 3, 0]$
- (x) $J(0, 0, 0) = [0, 3, 4]$

Correct

Well done!

For the function $u(x,y) = x^2 - y^2$ and $v(x,y) = 2xy$, calculate the Jacobian matrix $J = \begin{bmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{bmatrix}$.

- ○ $J = \begin{bmatrix} 2x & 2y \\ -2y & 2x \end{bmatrix}$
- ○ $J = \begin{bmatrix} 2x & -2y \\ -2y & 2x \end{bmatrix}$
- ○ $J = \begin{bmatrix} 2x & 2y \\ 2y & 2x \end{bmatrix}$
- ◉ $J = \begin{bmatrix} 2x & -2y \\ 2y & 2x \end{bmatrix}$

Correct

Well done!

For the function $u(x,y,z) = 2x + 3y$, $v(x,y,z) = cos(x)sin(z)$ and $w(x,y,z) = e^x e^y e^z$, calculate the Jacobian matrix $J = \begin{bmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} & \frac{\partial u}{\partial z} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} & \frac{\partial v}{\partial z} \\ \frac{\partial w}{\partial x} & \frac{\partial w}{\partial y} & \frac{\partial w}{\partial z} \end{bmatrix}$.

- ○ $J = \begin{bmatrix} 2 & 3 & 0 \\ sin(x)sin(z) & 0 & -cos(x)cos(z) \\ e^x e^y e^z & e^x e^y e^z & e^x e^y e^z \end{bmatrix}$
- ○ $J = \begin{bmatrix} 2 & 3 & 0 \\ -cos(x)sin(z) & 0 & -sin(x)cos(z) \\ e^x e^y e^z & e^x e^y e^z & e^x e^y e^z \end{bmatrix}$
- ○ $J = \begin{bmatrix} 2 & 3 & 0 \\ cos(x)sin(z) & 0 & -sin(x)cos(z) \\ e^x e^y e^z & e^x e^y e^z & e^x e^y e^z \end{bmatrix}$
- ◉ $J = \begin{bmatrix} 2 & 3 & 0 \\ -sin(x)sin(z) & 0 & cos(x)cos(z) \\ e^x e^y e^z & e^x e^y e^z & e^x e^y e^z \end{bmatrix}$

Consider the pair of linear equations $u(x, y) = ax + by$ and $v(x, y) = cx + dy$, where a, b, c and d are all constants. Calculate the Jacobian, and notice something kind of interesting!

- $J = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$
- $J = \begin{bmatrix} b & c \\ d & a \end{bmatrix}$
- $J = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

For the function $u(x, y, z) = 9x^2y^2 + ze^x$, $v(x, y, z) = xy + x^2y^3 + 2z$ and $w(x, y, z) = cos(x)sin(z)e^y$, calculate the Jacobian matrix and evaluate at the point $(0, 0, 0)$.

- $J = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

Correct
Well done!

- $J = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$
- $J = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$
- $J = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$