# ASSIGNMENT #1

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## Question #1

Find the value of $f_{yxxz}(x,y,z)$, if $f(x,y,z) = x^2yze^y + xy + y^2z + z^2xy^2$

## Solution

Given equation,
$f_{yxxz}(x,y,z) = ?$
$f(x,y,z) = x^2yze^y + xy + y^2z + z^2xy^2$

Taking partial derivative of function with respect to $y$,
$$f_y = \frac{\partial f}{\partial y} = \frac{\partial(x^2yze^y + xy + y^2z + z^2xy^2)}{\partial y}$$

Considering $x$ and $z$ as constants,
$f_y = x^2z[y.e^y(1) + e^y(1)] + x(1) + (2y)(1)z + z^2x(2y)(1)$
$f_y = x^2z[ye^y + e^y] + x + 2yz + 2xyz^2$

Taking partial derivative of $f_y$ with respect to $x$,
$$f_{yx} = \frac{\partial f_y}{\partial x} = \frac{\partial(x^2z[ye^y + e^y] + x + 2yz + 2xyz^2)}{\partial x}$$

Considering $y$ and $z$ as constants,
$f_{yx} = z[ye^y + e^y](2x) + 1 + 0 + 2yz^2$
$f_{yx} = 2xz(ye^y + e^y) + 1 + 2yz^2$

Taking partial derivative of $f_{yx}$ with respect to $x$,
$$f_{yxx} = \frac{\partial f_{yx}}{\partial x} = \frac{\partial(2xz(ye^y + e^y) + 1 + 2yz^2)}{\partial x}$$
$f_{yxx} = 2z(ye^y + e^y)$

Taking partial derivative of $f_{yxx}$ with respect to $z$,
$$f_{yxxz} = \frac{\partial f_{yxx}}{\partial z} = \frac{\partial(2z(ye^y + e^y))}{\partial z}$$
$f_{yxxz} = 2(ye^y + e^y)$

## Answer

$$f_{yxxz} = 2(ye^y + e^y)$$

# Question #2

Use dot product to find the angle between the following vectors:

$\vec{a} = -3j + 4k$, $\vec{b} = 3i + \sqrt{5}j + \sqrt{2}k$

# Solution

Given equation,

$\vec{a} = -3j + 4k$, $\vec{b} = 3i + \sqrt{5}j + \sqrt{2}k$

By using dot product formula,

$\vec{a}.\vec{b} = |a||b| \cos\theta$

$\vec{a}.\vec{b} = (0i + 3j + 4k).(3i + \sqrt{5}j + \sqrt{2}k)$

$\vec{a}.\vec{b} = -3\sqrt{5} + 4\sqrt{2}$

Taking magnitude of $a$,

$|a| = \sqrt{(0)^2 + (-3)^2 + (4)^2}$

$|a| = \sqrt{0 + 9 + 16}$

$|a| = \sqrt{25}$

$|a| = 5$

Similarly, taking magnitude of $b$,

$|b| = \sqrt{(3)^2 + (\sqrt{5})^2 + (\sqrt{2})^2}$

$|b| = \sqrt{9 + 5 + 2}$

$|b| = \sqrt{16}$

$|b| = 4$

Finally,

$\vec{a}.\vec{b} = |a||b| \cos\theta$

$$\frac{\vec{a}.\vec{b}}{|a||b|} = \cos\theta$$

$$\frac{-3\sqrt{5} + 4\sqrt{2}}{(5)(4)} = \cos\theta$$

$$\frac{-3\sqrt{5} + 4\sqrt{2}}{20} = \cos\theta$$

$$\cos^{-1}\left(\frac{-3\sqrt{5} + 4\sqrt{2}}{20}\right) = \theta$$

$\cos^{-1}(-0.052) = \theta$

# Answer

$\theta = 1.62338$

$\theta = 93°$