Multivar Quiz #2 Saaif Ahmed

Wednesday, September 16, 2020 1:55 PM

Honor Pledge:

"I have neither given nor received any illegal aid on this exam"

-Saaif Ahmed 9/16/20

For the function $f(x, y) = x^4y^3$, at the point $(1, 1)$:
(i) Find the unit vector in the direction of steepest ascent.
(ii) Find the unit vector in the direction of steepest descent.
(iii) What is the maximal rate of increase of the function f at $(1, 1)$?

$\nabla f = < 4x^3y^3, 3x^4y^2 >$
$\nabla f(1,1) = < 4, 3 >$

i)

Direction of ascent is ∇f
Unit vector is $\frac{\nabla f}{||\nabla f||} = \frac{<4,3>}{5} = < 0.8, 0.6 >$

ii)

Direction of descent is negative ∇f
Thus unit vector is $< -0.8, -0.6 >$

iii)

The maximal rate is $\big|\big||\nabla f|\big|\big|$
Thus it is $\big|\big||\nabla f|\big|\big| = 5$