MATH 3383: Homework 2 - Yessica Gaona M.

① Find the linear and quadratic Taylor polynomial of $f(x,y) = x^5y^3 + \sin^2(\pi x)\cos(\pi y)$ @ the point $(x_0, y_0) = (1,1)$.

① $f^{(0,0)}(1,1) = 1^5 1^3 + \sin^2(\pi)\cos(\pi) = 1$

② $f^{(1,0)}(x,y) = 5y^3x^4 + 2\pi\cos(\pi y)\sin(\pi x)\cos(\pi x) = 5y^3x^4 + \pi\cos(\pi y)\sin(2\pi x)$

$f^{(1,0)}(1,1) = 5 + \pi\cos(\pi)\sin(2\pi) = 5$

③ $f^{(0,1)}(x,y) = 3x^5y^2 - \pi\sin^2(\pi x)\sin(\pi y)$

$f^{(0,1)}(1,1) = 3 + \pi\sin^2(\pi)\sin(\pi) = 3$

④ $f^{(2,0)}(x,y) = 20y^3x^3 + 2\pi^2\cos(\pi y)\cos(2\pi x)$

$f^{(2,0)}(1,1) = 20 + 2\pi^2\cos(\pi)\cos(2\pi) = 20 - 2\pi^2$

⑤ $f^{(0,2)}(x,y) = 6x^5y - \pi^2\sin^2(\pi x)\cos(\pi y)$

$f^{(0,2)}(1,1) = 6 - \pi^2\sin^2(\pi)\cos(\pi) = 6$

⑥ $f^{(1,1)}(x,y) = 15x^4y^2 - 2\pi^2\sin(\pi x)\cos(\pi x)\sin(\pi y) = 15x^4y^2 - \pi^2\sin(2\pi x)\sin(\pi y)$

$f^{(1,1)}(1,1) = 15 - \pi^2\sin(2\pi)\sin(\pi) = 15$

Linear taylor Polynomial -

$P_1(1,1) = 1 + 5(x-1) + 3(y-1)$

Quadratic Taylor Polynomial -

$$P_2(1,1) = 1 + 5(x-1) + 3(y-1) + \frac{(20-2\pi^2)(x-1)^2}{2!} + \frac{6(y-1)^2}{2!} + 15(x-1)(y-1)$$