Name: ID #: Section #:

Q1) [**3pts**] Find the linear approximation of $f(x,y) = xy + \sqrt{y + \cos^2 x}$ at $(0,0)$ and use it to approximate the value of $f(0.01, -0.02)$.

Q2) [**4pts**] Let $f(x,y) = \dfrac{x \cos xy}{3x^2 + y^2}$.

(a) Does $\lim\limits_{(x,y)\to(0,0)} f(x,y)$ exist? (Justify your answer)

(b) Where is $f(x,y)$ continuous?

Q3) [**3pts**] Let $F(x,y) = \ln(xy) + \dfrac{x-y}{x+y}$. Find the value of $F_y(1,2) + F_x(1,2)$.

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Q1) [**3pts**] Find an equation of the tangent plane to the surface $f(x, y) = \sqrt{x + \cos^2 y}$ at $(0, 0, 1)$.

Q2) [**4pts**] Let $f(x, y) = \dfrac{x^2 + \sin^2 y}{2x^2 + y^2}$.

(a) Does $\lim\limits_{(x,y)\to(0,0)} f(x, y)$ exist? (Justify your answer)

(b) Where is $f(x, y)$ continuous?

Q3) [**3pts**] Let $F(x, y, z) = y\sqrt{x - z}$. Find the value of $F_{zz}(2, 1, -2) + F_{zyx}(2, 1, -2)$.