Name: ID #: Section #:

Q.1 [**2pts**] Compute the directional derivative of $f(x, y) = \sqrt{xy}$ at $P(4, 1)$ in the direction of vector $\vec{a} = \langle 1, -2 \rangle$.

Q.2 [**4pts**] Find the local maximum and local minimum values and saddle points of $f(x, y) = 2y^3 + x^2y + 5y^2 + x^2$.

Q.3 [**4pts**] Find extreme values of $f(x, y) = 2y^2 + 3x^2 - 4y - 5$ on the circle $x^2 + y^2 = 9$.

Name: ID #: Section #:

Q.1 [**2pts**] Compute the directional derivative of $f(x, y) = \sqrt{xy}$ at $P(1, 4)$ in the direction of vector $\vec{a} = \langle 2, -1 \rangle$.

Q.2 [**4pts**] Find the local maximum and local minimum values and saddle points of $f(x, y) = 2x^3 + xy^2 + 5x^2 + y^2$.

Q.3 [**4pts**] Find extreme values of $f(x, y) = 2x^2 + 3y^2 - 4x - 5$ on the circle $x^2 + y^2 = 16$.
