ASU Practice Midterm 2

Problem 1: Use the Chain Rule to find $\frac{\partial z}{\partial s}$ if

$$\begin{cases} z = & e^{xy} \\ x = & 7s + 8t \\ y = & st^4 \end{cases}$$

Problem 2: Find the maximum rate of change for $f(x, y) = x^3y^2$ at the point $(3, 2)$

Problem 3: Reverse the order of integration for the double integral

$$\int_0^1 \int_y^1 f(x, y)dxdy$$

Problem 4: By changing to polar coordinates, evaluate the following integral, where D is the disk $x^2 + y^2 \leq 4$

$$\int\int_D \left(x^2 + y^2\right)^{\frac{3}{2}} dA$$

Problem 5: Find the differential of the function $z = 3y\sqrt{x}$

Problem 6: Find the domain of the function $f(x, y) = \sqrt{x} + \sqrt{y}$

Problem 7: Find the directional derivative of the function $f(x, y) = 2x^2y^3 + 3x$ at the point $(1, -2)$ in the direction of the vector $\mathbf{v} = 5\mathbf{i} + 12\mathbf{j}$

Problem 8: Find an equation of the tangent plane to the surface $xyz + y^2 + z^3 = 6$ at the point $(1, 2, 3)$

Problem 9: Find all critical points for the function $f(x, y) = x^3 - 12xy + 8y^3$ and classify them as either a local minimum, local maximum, or saddle point

Problem 10: Compute the following double integral, where $D = [0, 1] \times [-1, 2]$

$$\int \int_D 2x + 3y^2 dydx$$