6/6

1. (6 pts) Let $z = x^2 + xe^{-y^2}$. Find each of the following:

(a) $\frac{\partial z}{\partial x} = 2x + e^{-y^2}$

(b) $\frac{\partial z}{\partial y} = 0 - 2y\frac{x}{e^{y^2}} = -2yxe^{-y^2}$

(c) $\frac{\partial^2 z}{\partial y^2} = -2xe^{-y^2} + -2y(-2ye^{-y^2}) = -2xe^{-y^2} + 4y^2e^{-y^2}$

2. (3 pts) The temperature at a point (x, y) on a metal plate in the xy-plane is given by $T(x, y) = 2x^2 - y^3 + x$ degrees Celsius. Assume x, y are measured in centimeters.

(a) (1 pt) What is the temperature at the point $(2, 1)$?

1/1 $T(2,1) = 2(2)^2 - 1^3 + 2 = 8 - 1 + 2 = 9^\circ C$

(b) (2 pts) What is the rate at which the temperature changes with respect to distance if we start at the point $(2, 1)$ and move parallel to the x-axis in the direction of increasing x? Give units to your answer.

2/2 $(2,1)\ \frac{\partial T}{\partial x} = 4x - 0 + 1 = 9^\circ C/cm$

$4(2) + 1 = 9$

3. (2 pts) Specify the domain of the function $f(x, y) = 4 - x^2 - y^2$ and sketch its graph.

2/2 $D = \{(x, y) : \mathbb{R}\}$

$x^2 + y^2 + z = 4$

$x^2 + y^2 + (z - 4) = 0$