Name:

1. The temperature on metal plate is given by

$$T(x, y) = \frac{50}{1 + x^2 + y^2}$$

where T is measured in °C and x and y are measured in centimeters from the center of the plate.

1. Compute $\vec{\nabla}T(x, y)$.

2. At the point $P = (2, 1)$ determine the direction $\mathbf{u}$ of maximum increase of the temperature. Express your answer as a unit vector.

3. A bug is at $P = (2, 1)$ and crawling with velocity $\mathbf{v} = \langle 0, 1 \rangle$ centimeter/second. What is the rate of change in temperature that the bug sees? Your answer should have units of °C per second.

2. Consider the surface given by $z = f(x, y)$ with

$$f(x, y) = x^2 - 2y^2.$$

At the point $P = (2, 3)$ we have:

$$f(2, 3) = -14$$
$$f_x(2, 3) = 4$$
$$f_y(2, 3) = -12.$$

Determine the equation of the tangent plane to the surface at P.