Name	CSU ID #

Be sure to read each question fully and carefully. Multiple choice answer bubbles must be fully filled in. There is space to the right of each multiple choice question to show work, if your work is correct you can get points even with an incorrect multiple choice answer. Each question is worth the same amount of points.

1. Quick, you want to chill out, the temperature in the room is described by the function
$$T(x, y) = 8x + 6y.$$
Out of the following options, around the direction of which vector should you move in order to cool down the fastest independent of where you are?
   - ○ $-\boldsymbol{i} + \boldsymbol{j}$
   - ○ $-\boldsymbol{i}$
   - ○ $-\boldsymbol{i} - \boldsymbol{j}$
   - ○ $-\boldsymbol{j}$
   - ○ $\boldsymbol{i} - \boldsymbol{j}$

2. Suppose we have a function $z = f(u, v)$ such that
$$u = x^2 - y^2, \quad \text{and} \quad v = y^2.$$
Evaluating the expression $yz_x + xz_y$ with the chain rule we obtain the expression:
   - ○ $2xyf_v$
   - ○ $2xyf_u$
   - ○ $-2xyf_u + 2xyf_v$
   - ○ $2xf_u$
   - ○ None of the above options

3. If π is the tangent plane of the paraboloid
$$z = x^2 + y^2$$
at the point $(1, 2, 5)$, which of the following points also belongs in that plane?
   - ○ $(1, 1, -1)$
   - ○ $(-1, 1, 1)$
   - ○ $(1, -1, 5)$
   - ○ $(5, -1, 1)$
   - ○ None of the above options