

MATH 2415 Test 3

Name: _____

1. Suppose that temperature as a function of position (x, y, z) in a tank of fluid is modeled by $T(x, y, z) = 3x^{-9}y^4z^{-2}$.

- (i) What is the temperature T_0 at $(x_0, y_0, z_0) = (1, 1, 1)$?
- (ii) At $(x, y, z) = (1, 1, 1)$, in what direction is the temperature increasing fastest?
- (iii) Give an equation for the plane tangent to $T(x, y, z) = T_0$ at $(1, 1, 1)$.
- (iv) If a temperature probe is moving through $(1, 1, 1)$ with velocity $\langle 9, 4, -5 \rangle$, then what is the rate of change of its temperature?

2. $f(x, y) = 9x^3 + 6xy + 5y^2 + 17$ has two critical points.

- (i) Find formulas for f_x and f_y .
- (ii) Find formulas for f_{xx} , f_{xy} , and f_{yy} .
- (iii) Classify the critical point $(0, 0)$ as a saddle point, location of a local maximum, or location of a local minimum.
- (iv) Find the other critical point and classify it.