

1. [4pts] Find the limit if it exists, or show it does not exist:  $\lim_{(x,y) \rightarrow (0,0)} \frac{y^4}{x^4 + 5y^4}$

2. [6pts] Let  $z = \ln(e^{4x} + e^y)$

(i) Compute (and simplify):  $z_x + 4z_y$

(ii) Use (i) and Clairaut's Theorem to compute and simplify:  $z_{xx}z_{yy} - (z_{xy})^2$ .