Homework 15: Due Thursday, Oct 31

Be sure to read the notes before attempting these problems.

Determine if the limit exists. If it does, find it. If it does not, prove it by finding two distinct limiting values.

1. \( \lim_{(x,y) \to (1,2)} 5x^3 + y \)
2. \( \lim_{(x,y) \to (0,0)} \frac{x^4 - 4y^4}{x^2 + 2y^2} \)
3. \( \lim_{(x,y) \to (1,1)} \frac{x^2 + y^2 - 2}{\sqrt{x^2 + y^2} - 1 - 1} \)
4. \( \lim_{(x,y) \to (0,0)} \frac{2xy}{x^2 + y^2} \)
5. \( \lim_{(x,y) \to (1,0)} \frac{7xy^3 - 7y^3}{(x - 1)^4 + y^4} \)
6. \( \lim_{(x,y) \to (0,0)} \frac{5y^4 \cos^2(x)}{x^4 + y^4} \)