Intuition

Please check the tutorial7 note for intuition and useful formulas.

Question 1:

Find the limit, if it exists, or show that the limit does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{5y^4 cos^2 x}{x^4+y^4}$$

1. Intuitively, does the limit exist or not?
   (Hint: What does $cos^2 x$ contributes to the numerator part?)

2. If the limit exist, can you prove it and find the limit? If not, can you prove that the limit does not exist? (Hint: Can you combine x^4 and y^4 along some path?)

Question 2:

Find the limit, if it exists, or show that the limit does not exist.

$$\lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}}$$

1. Intuitively, does the limit exist or not?
   (Hint: Which has the higher 'degree' intuitively, numerator or denominator? You can maybe think of xy be degree 2)

2. If the limit exist, can you prove it and find the limit? If not, can you prove that the limit does not exist? (Hint: Squeeze Theorem, relation between x^2+y^2 and xy?)

Note

Please work on more questions in the section14.2 Q5-22 of the textbook. You will see questions of many more different types, including trigonometry, exponential, etc.