

Question 1

Evaluate

$$\lim_{(x,y) \rightarrow (2,-1)} (x^2y + 3xy^2 - 2y + 5).$$

Tasks

1. State why direct substitution is valid.
2. Evaluate the limit exactly.
3. Verify the arithmetic term by term.

Question 1 – Solution

Strategy. A polynomial in two variables is continuous everywhere, so its limit equals its value at the target point.

Step 1: Continuity Each monomial and constant is continuous, and finite sums of continuous functions are continuous. Direct substitution is therefore valid.

Step 2: Substitute

$$\begin{aligned}x^2y + 3xy^2 - 2y + 5 &= (2)^2(-1) + 3(2)(-1)^2 - 2(-1) + 5 \\&= -4 + 6 + 2 + 5 = 9.\end{aligned}$$

Thus

$$\boxed{\lim_{(x,y) \rightarrow (2,-1)} (x^2y + 3xy^2 - 2y + 5) = 9}.$$

Verification. The four contributions are -4 , 6 , 2 , and 5 ; their sum is 9 . No denominator or restricted operation can fail at $(2, -1)$.