Partial Fractions: Decompose Rational Expressions Step by Step

Worked example / complete source key

Decompose (3x+5)/((x-1)(x+2)) into partial fractions.

Answer: (8/3)/(x-1) + (1/3)/(x+2)

Reason: Set up A/(x-1) + B/(x+2). Multiply both sides by (x-1)(x+2): 3x+5 = A(x+2) + B(x-1). Substitute x=1: 3(1)+5=8 and A(1+2)=3A, so 3A=8 and A=8/3. Substitute x=-2: 3(-2)+5=-1 and B(-2-1)=-3B, so -3B=-1 and B=1/3. Thus the decomposition is (8/3)/(x-1) + (1/3)/(x+2). Check by combining: (8/3)/(x-1) + (1/3)/(x+2) = [8(x+2)+1(x-1)]/[3(x-1)(x+2)] = (8x+16+x-1)/[3(x-1)(x+2)] = (9x+15)/[3(x-1)(x+2)] = (3x+5)/[(x-1)(x+2)], which matches the original.