Prize Problem

Let $P(x) = x^6 - x^5 - x^3 - x^2 - x$ and $Q(x) = x^4 - x^3 - x^2 - 1$ and suppose that r_1, r_2, r_3, and r_4 are roots of Q. Calculate $P(r_1) + P(r_2) + P(r_3) + P(r_4)$.