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1. Eliminate trigonometric functions in
$$\sin(5\arctan(x)).$$

2. Simplify
$$\sin^3(x)\sin(3x) + \cos^3(x)\cos(3x)$$

3. Simplify
$$\ln\left(\frac{\sqrt{x}}{x}\right) + \ln\left((ex^2)^{1/4}\right)$$

assuming x is positive and real.

4. Factor
$$2x^4y^6 + 6x^2y^3 - 20$$

5. Find the partial fraction decomposition of
$$\frac{x^2 + 2x - 1}{2x^3 + 3x^2 - 2x}$$

6. Find the coefficient of x^3 in the expanded form of the polynomial
$$(1 + x - 2y)^6$$

7. Find the coefficient of x^4y^3 in the expanded form of the polynomial
$$(4x + 5y)^7$$