Homework Assignment 2.

I. Look up the Expand[], ExpandAll[], Factor[] and Simplify[] commands, and the Trig option. Then
   a) Evaluate $e^{in\pi/2}$ for $n = 0 \ldots 4$
   b) Expand and recover \( \frac{(x-a)(x-b)(x-c)}{(x-d)(x-e)(x-f)} \)
   c) Express \((\sin^4(x) - \cos^4(x))^2\) in terms of \(\cos(2x)\) or \(\cos(4x)\)

II. Look up the D[] and Integrate[] commands. Then compute and simplify:
   a) \( \frac{d}{dx} \left[ f^2(x) \sqrt{g(x)} \sin(x)/x^3 \right] \)
   b) \( \int dx \ e^{-x}x^2 \cos(x) \)
   c) \( \int dx \ \sin^5(x) \)
   d) \( \int_0^1 dx \ x^2(1-\ x)^3 \)
   e) \( \int_0^\infty dx \ x^{n-1} e^{-ax} \) and evaluate for \(a = 1\), \(n = 5\)
   In b) and c) verify the correctness of the answer by differentiation.

III. Look up the Solve[] and FindRoot[] commands. Then find the roots of
   a) \( x^4 - x + 1 = 0 \); compute the sum and product of the roots.
   b) \( \cos^2(x) = 3 \tan(\sin(x)) \log(1 + x) \) in \((0, 1)\).