Quiz 5

Problem 1. Does knowledge exist? If so, how could you be sure when you have it? (One popular criteria is that knowledge be a justified true belief)

Problem 2. Perform the operation and write the result in standard form:

\[
\frac{i}{3+i} + \frac{6}{3-i} = \frac{i(3-i)}{(3+i)(3-i)} + \frac{6(3+i)}{(3-i)(3+i)}
\]

\[
= \frac{3i-1}{9-i^2} + \frac{18+6i}{9-i^2} = \frac{1+3i}{10} + \frac{18+6i}{10} = \frac{19+9i}{10}
\]

Problem 3. Let \( n \) be a positive integer. Use division to simplify the following:

Let \( y = x^n \). Then it becomes:

\[
\frac{x^{3n} - 7x^n + 6}{x^n - 1}
\]

\[
\frac{y^3 - 7y + 6}{y-1}
\]

Use synthetic div:

\[
1 | 1 0 -7 6
\]

\[
1 1 -6
\]

\[
1 1 -6 0
\]

So \( \frac{y^3 - 7y + 6}{y-1} = y^2 + y - 6 \)

So \( \frac{x^{3n} - 7x^n + 6}{x^n - 1} = x^{2n} + x^n - 6 \)

Problem 4. Write the equation of a 6th degree polynomial \( f(x) \) given that \( f(x) = 0 \) for \( x = 4, x = -6 \) and \( x = -10/9 \). Do the same for a 5th degree polynomial \( g(x) \), with \( g(x) = 0 \) for \( x = 4, x = -6 \) and \( x = -10/9 \)

Lots of answers:

\[
f(x) = (x-4)(x+6)(x+10/9)(x-a)(x-b)(x-c)
\]

\[
g(x) = (x-4)(x+6)(x+10/9)(x-d)(x-e)
\]

Pick any real numbers for \( a, b, c, d, e \), but they need to be there for \( f \) to have degree 6, and \( g \) degree 5.