Math 105 Sample Test 3

Dr. Ahlbrandt

100 points total

Your Name

Part A. Do not use a calculator on this portion. Turn it in before you start part B. Show all your work for full credit. Solve the problems by solving the equations and show all the steps to complete the problem. No points will be given for just the answers. The points for each problem are given in brackets. Good luck!

1.[10] Use the fact that \( f(x) = x^3 - x^2 + 4x + 6 \) has a zero at \( x = -1 \) to find the other zeros.

2.[8] Find a quadratic polynomial with rational coefficients with the zero \( x = 2 - \sqrt{2} \).

3. [9 each] Sketch the graph for each of the following functions. Make sure to include all asymptotes as dashed lines.

   a. \[ y = \frac{1}{(x + 1)^2} \]

   b. \[ y = 3^x - 4 \]
4. [8] Find a function $f(x)$ so that $h(x) = \frac{x^2 + 1}{x^2 - 2}$ is equal to $(f \circ g)(x)$ with $g(x) = x^2 + 1$.

5. [10] The point $(1,3)$ is on the graph of a line with $x$-intercept $(a,0)$ and $y$-intercept $(0,b)$. Find $a$ as a function of $b$. (Assume that $b > 3$.)

6. [8] For $f(x) = 3x + 1$ compute $f^{-1}(x)$.

7. [8] Is $f(x) = (x+1)^2$ one-to one? Explain your reasoning.
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Part B. You can use a calculator for these problems.
Show all your work for full credit. Set up equations and show all the steps to complete the problem. No points will be given for just the answers. If you use the calculator explain what you did. The points for each problem are given in brackets. Good luck!

1. [10] Find an expression for a rational function with horizontal asymptote y = 2, vertical asymptote x=1 and x-intercept (4,0). Show enough work to make it clear how you proceed.

2. [10] Find the equation of the 3rd degree polynomial in the sketch. (Don't simplify.) (Assume that all intercepts are whole numbers.)

3. [10] Solve $\frac{x + 1}{x^2 - 4} > 2$. Express your answer in interval notation with exact solutions.

The graph of $f(x) = \frac{x + 1}{x^2 - 4}$ is given below.