

BRONX COMMUNITY COLLEGE
of the City University of New York

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MATH 30
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Midterm (Take II)
April 15, 2010

Name: _____

Directions: Write your answers in the provided space. To get full credit you *must* show all your work. Simplify your answers whenever possible. Be certain to indicate your final answer clearly. This exam has a total of 110 points. However the perfect score is 100 points, there are 10 points of extra credit.

1. Find the domain for each of the following functions:

(a) (10 points) $f(x) = \frac{x^2 - 3x + 1}{x^2 + 4x + 3}$

(b) (10 points) $g(x) = \sqrt{-x^2 + x + 6}$

(c) (10 points) $h(x) = \log_{42}(x^2 + 4)$

2. (15 points) Find $f \circ g$, where $f(x) = \frac{x^2 + 1}{x^2 - 4}$ and $g(x) = \sqrt{2 - 4x}$

3. (15 points) Prove that $f(x) = \frac{3x - 2}{2x + 1}$ and $g(x) = \frac{x + 2}{3 - 2x}$ are a pair of inverse functions.

4. Consider the function $f(x) = x^2 - 4x + 7$.

(a) (5 points) Show that f is not one-to-one.

(b) (15 points) Restrict the domain of f in such a way that it becomes one-to-one. Then find the inverse of the restricted function.

5. (a) (15 points) Sketch a rough graph of the following function. The graph should correctly reflect the end behavior, the behavior near zeros and the number of turning points. The yintercept should also be correctly marked.

$$p(x) = x^5 + x^4 - 5x^3 + 4x - 5x^2 + 4$$

- (b) (5 points) Solve the inequality: $x^5 + x^4 - 5x^3 + 4x - 5x^2 + 4 < 0$

6. (10 points) For a polynomial $p(x)$ the graph of $y = p(x)$ has the following properties:

- The only x -intercepts are at $x = -1$, $x = 2$ and $x = 3$.
- The y -intercept is at $y = -12$
- As $x \rightarrow \infty$, $p(x) \rightarrow \infty$ and as $x \rightarrow -\infty$, $p(x) \rightarrow \infty$.

Give an example of such a polynomial.