MAT 121 Midterm Test - Fall, 2013 Name_____
100 Points Covers Chapters 1 - 3

1. (5 pts each) Find all real or nonreal solutions:

   a. $4x^2 = 3$

   b. $6x^2 - 5x + 3 = 0$

2. (10 pts) Compute the discriminant for each of the following equations and tell me what it tells you about the solutions of the equations, *without having to solve them*, i.e., don't solve.

   a. $x^2 - 5x - 6 = 0$

   b. $x^2 + 5x + 11 = 0$

3. (5 pts) Solve $x^2 - 10x - 17 = 0$ by completing the square. You can spoof me by re-writing $x^2 - 10x - 17$ in the form $a(x-h)^2 + k$, setting it equal to zero, and solving, if you know a trick for obtaining $a(x-h)^2 + k$.

4. (5 pts each) Find an equation of the line through $(11,7)$ that is…

   a. … parallel to $y = \frac{4}{3}x - 312$

   b. … perpendicular to $y = \frac{4}{3}x - 312$

5. (5 pts each) Solve the inequalities.

   a. $|3x+7| \geq 9$

   b. $|2x-3| < -7$

6. (5 pts) If I take 6 hours to paint the room and Isamar takes 4 hours to paint the room, how long does it take us, if we work together? Decimal/Fraction answer is OK. To the nearest *minute* is worth 2 bonus.

7. (5 pts) Use synthetic division to find $P(2)$ if $P(x) = 3x^4 - 2x^3 + 5x - 11$.

8. (5 pts) Construct a polynomial (in factored form) of minimal degree that has real coefficients (if you expand it, but *don't* expand it!) and the following zeros, with the indicated multiplicities. Do *not* expand..

$x = 1, m = 2;\ x = -7, m = 13;\ x = 2 - 3i, m = 1.$

9. (5 pts) Multiply (Expand) and simplify the product: $(x-(4+7i))(x-(4-7i))$.

10. (5 pts) Sketch the graph of $\frac{2x-4}{x+1}$. Show all asymptotes and intercepts.

11. (5 pts) Based on your work on the previous problem, give a quick sketch of $g(x) = \frac{(2x-4)(x-3)}{(x+1)(x-3)}$

12. (5 pts) Solve the inequality $x^2 - 7x + 12 > 0$. Give answer in set-builder and interval notation.

13. (10 pts) Let $f(x) = \dfrac{x-3}{x-5}$ and $g(x) = \sqrt{x-7}$. Form the composite function $(f \circ g)(x)$. Do not simplify.

What is the domain of $f \circ g$?

14. (10 pts) Sketch the graph of $g(x) = -3\sqrt{-x+4} - 7$ by transforming a basic function. Show at least 2 points in the 1st graph and track their movements through the transformations.

Bonus (5 pts each) Answer up to two of the following. I grade the 1st ones I come to.

a. Solve the inequality: $(x-2)^2(x+5)^3\left(x-\sqrt{2}\right)\left(x+\sqrt{2}\right)\le 0$

b. Solve the inequality: $\dfrac{\left(x-\sqrt{2}\right)\left(x+\sqrt{2}\right)}{(x-2)^2(x+5)^3}\le 0$

c. Simplify the difference quotient for $f(x)=x^3-2x$.

d. (Refer to #6.) How many hours did Isamar work, if I showed up an hour late, and we finish the job together? Answer to the nearest minute.