MAT 121-G11 Final Fall, 2010
200 Points

Name_____

1. Solve $x^2 - 4x - 12 = 0$ in 3 ways:
   a. (10 pts) Factoring

   b. (10 pts) Completing the square

   c. (10 pts) Quadratic formula

2. Solve the following absolute value equations and inequalities:

   a. (10 pts) $|2x - 4| = 5$

   b. (10 pts) $|2x - 4| < 5$

   c. (10 pts) $|2x - 4| \geq 5$

3. (10 pts) Let $f(x) = -3^{2x-7} + 3$. Find the inverse function $f^{-1}(x)$.

4. (10 pts) Find an equation of the line through (-5, -3) and (-1, 5). Point-slope form is preferred.

5. (10 pts) Graph the line $3x - 7y = 13$. Show intercepts.

6. (10 pts) Solve $\frac{(x-2)(x+3)^3}{(x+1)^2} \geq 0$.

7. (10 pts) What is the domain of $\log_5\left(\frac{(x-2)(x+3)^3}{(x+1)^2}\right)$? Hint: You just did most of the work.

8. Compute the sums:

a. (5 pts) $\sum_{k=1}^{75} 2(-1.07)^{k-1}$

b. (5 pts) $\sum_{k=1}^{\infty} 5\left(\frac{5}{7}\right)^{k-1}$

9. (10 pts) Use the Binomial Theorem (Pascal's Triangle) to expand $(2x-y)^6$. Best you can earn by brute force is half-credit.

10. (10 pts) Let $f(x) = x^2 - 2x + 6$. Simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$.

11. (10 pts) Use synthetic division to find $f(3)$ for $f(x) = x^5 - 3x^4 - 10x^2 + 4x - 10$.

12. (10 pts) Expand the product: $(x - (2 + 3i))(x - (2 - 3i))$

13. (10 pts) Write a polynomial (in factored form) with *real* coefficients, of degree 5, that has the given zeros with the given multiplicities:

zero	multiplicity
2	1
-3	3
3-7*i*	1

14. (10 pts) Sketch the graph (rough) of $f(x) = (x - 2)(x + 3)^3(x + 1)^2$. Show all intercepts.

15. (10 pts) The half-life of radioactive Millsium is 35 years (assuming a life span of 3-score-and-10). Build an exponential model $A(t) = A_0 e^{-kt}$. Then use this model to predict the age of a sample that has 5% of its radioactive Millsium remaining.

16. (10 pts) Sketch the graph of $g(x) = -3\left(2^{3-x}\right) + 8$ by transforming the function $f(x) = 2^x$.

17. (10 pts) **Bonus** Let P = present value (principal), R = Periodic payment, i = interest rate per period, n = total number of periods. If you want to borrow the amount P from a banker, you must make (monthly) payments R. Solve this equation for R to see what the formula is for loan payment amount, when you borrow P dollars.

$$R\left[\frac{(1+i)^n - 1}{i}\right] = P(1+i)^n$$

Simplify your answer as much as possible. The result is the "Loan Amortization" formula, which gives your (monthly) payment as a function of the amount borrowed and the interest rate.