## Math 120 Fall 2013 Exam 4

## NAME:

1. 10 pts. Use synthetic division to perform the division:

$$\frac{3x^4 - 4x^2 + 2}{x + 1}$$

2. 10 pts. Factor

$$f(x) = x^4 + 2x^3 - 7x^2 - 20x - 12$$

into linear factors given that -2 is a zero of f with multiplicity 2.

- 3. Let  $f(x) = x^4 + 2x^3 + x^2 + 8x 12$ .
  - (a) 5 pts. List the possible rational zeros of f.
  - (b) 10 pts. Find all zeros of f, including complex zeros. Give exact values.
  - (c) 5 pts. Factor f(x) into linear factors.
- 4. 10 pts. Find a polynomial function f of degree 3 that has real coefficients, zeros -2, 1, 0, and is such that f(-1) = 6.
- 5. 10 pts. Find a polynomial function of lowest degree with rational coefficients that has 2-i and -1 as some of its zeros.
- 6. <u>5 pts. each</u> Let  $f(x) = \frac{x(x-2)}{(x+3)^2}$ .
  - (a) Find the domain of f.
  - (b) Find the intercepts of f.
  - (c) Find all vertical asymptotes of f.
  - (d) Find the horizontal or oblique asymptote of f.
  - (e) Find all points where f intersects its horizontal or oblique asymptote.
  - (f) Sketch the graph of f, finding additional points as needed.
- 7. 5 pts. each Suppose that \$1000 is invested at 9.2% interest, compounded quarterly.
  - (a) Find the function for the amount to which the investment grows after t years.
  - (b) Find the amount of money in the account at time t = 5 and t = 10 years.

- 8. 10 pts. Express  $2\log_5 a 3\log_5 b^2$  as a single logarithm with coefficient 1.
- 9. 10 pts. each Solve the equation algebraically.

(a) 
$$5^{4x-7} = 125$$
  
(b)  $3^x = 2^{x-1}$   
(c)  $\log_2(10+3x) = 5$ 

- (d)  $\log_2(x+1) + \log_2(x-1) = 3$
- 10. 10 pts. Find the time required for an investment of \$5000 to grow to \$7500 at an annual interest rate of 9% per year, compounded monthly.
- 11. 10 pts. Find the doubling time of an investment earning 3.6% interest if interest is compounded continuously.
- 12. 15 pts. Pinky and the Brain have 150 grams of radioactive narfzortium-343 in the lab. Upon returning from a frenzied spin around town in a nitro powered funny car one hour later, they find that 148 grams of <sup>343</sup>Nz remain. After how many hours will only 100 grams remain? (Recall that the basic model for a radioactive decay process is  $A(t) = A_0 e^{-kt}$ , so here  $A_0$  and k will need to be determined first.)

## Some formulas that may be useful:

$$A = Pe^{rt}$$
$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$