Math 120
Exam #4
Spring 2011

Name:

1. [10 pts.] Use synthetic division to perform the division: $\dfrac{x^5 + 3x^4 + 2x^3 + 2x^2 + 3x + 1}{x + 2}$

2. Consider the polynomial function f defined by $f(x) = 8x^4 - 2x^3 - 27x^2 - 7x + 10$.

   (a) [5 pts.] Applying the Rational Zeros Theorem, list the possible rational zeros of the function.

   (b) [10 pts.] Find all rational zeros of f.

   (c) [5 pts.] Fully factor the polynomial $f(x)$.

3. [10 pts.] Find a polynomial function f of degree 3 with -2, 1, and 4 as zeros, and $f(2) = 16$

4. [10 pts.] Find a polynomial function of least degree with real coefficients and having 3 and $2 + i$ as zeros.

5. [10 pts. each] Solve each equation.

   (a) $64^{2x-1} = 4^{3x}$

   (b) $y = \log_8 \sqrt[4]{8}$

   (c) $\log_x 3 = -2$

6. [10 pts. each] Solve each equation. When solutions are irrational, give them as decimals correct to four decimal places.

   (a) $6^{x+3} = 5^x$

   (b) $\ln(3x + 8) = \ln(18)$

   (c) $\log_2 x + \log_2(x + 2) = 3$

7. [10 pts.] Find the required annual interest rate to the nearest tenth of a percent for $1200 to grow to $3000 if interest is compounded monthly for 5 years.

8. [10 pts. each] The amount of radioactive material, in grams, present after t days is modeled by $A(t) = 600e^{-0.0057t}$.

   (a) Find the amount present after three weeks.

   (b) Find the half-life of the material.

9. [15 pts.] Cobra Commander has 260 grams of kaboomium-320 in the basement of his secret hideout. Upon returning from a carefree 5-hour drive with Destro in the countryside in his spiffy new Nissan Cube, he finds that 192 grams remain. After how many hours will only 10 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.

10. [10 pts. each] Solve each system of equations.

    (a)
    $$\begin{cases} 2x - 3y = -7 \\ 5x + 4y = 17 \end{cases}$$

    (b)
    $$\begin{cases} 4x - y + 3z = -2 \\ 3x + 5y - z = 15 \\ -2x + y + 4z = 14 \end{cases}$$