MATH 120
SPRING 2012
EXAM 4

NAME:

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

$$\frac{x^5 - x^4 + 2x^2 + 3x + 1}{x - 2}$$

2. Consider the polynomial function f defined by $f(x) = 2x^4 + 15x^3 + 31x^2 + 20x + 4$.

   (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 -1, 3, and 0 as zeros, and $f(-3) = 10$.

4. [10 pts.] Find a polynomial function of least degree with real coefficients and having 2 and $3 - i$ 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) $6^{x+3} = 8^x$

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

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

7. [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 quarterly.

8. [10 pts.] Find the doubling time of an investment earning 3.6% interest if interest is compounded continuously.

9. The number of fish of a certain species is given by the formula

$$n(t) = 12e^{0.012t},$$

   where t is measured in years and $n(t)$ is measured in millions.

   (a) [5 pts.] What will the population of fish be after four years?

   (b) [10 pts.] After how many years will the number of fish reach 35 million?

A couple formulas that should be of some use:

$$A = Pe^{rt}$$

$$A = P\left(1 + \frac{r}{m}\right)^{mt}$$