1.   (5 pts) Form a polynomial in factored form with *real* coefficients with the given zeros and degree. Please do not expand the polynomial.

Zeros: -3, multiplicity 2;   5, multiplicity 2. Degree 4.

2.   (5 pts) Expand $(x-4-2i)(x-4+2i)$

3.   (10 pts) Use synthetic division to find $P(2)$ if $P(x) = 3x^4 - 2x^2 + 5x + 1$.

4.   (10 pts) Divide $f(x) = 2x^4 - x^3 + 3x^2 - 4$ by $d(x) = x^2 + 1$. Then write the result in the form $Dividend = Divisor \cdot Quotient + Remainder$.

5.   Solve the inequalities:

   a.   (5 pts) $-4(x-1)^2(x-2)(x-4)^3 \geq 0$

   b.   (5 pts) $\dfrac{-4(x-1)^2}{(x-2)(x-4)^3} \geq 0$

6.   (10 pts) Find all intercepts, asymptotes and holes, and then sketch the graph of

$$f(x) = \frac{x^3 - 3x^2 - 4x + 12}{x^3 + 2x^2 - 5x - 6} = \frac{(x-2)(x+2)(x-3)}{(x-2)(x+3)(x+1)}$$

7.   Solve the equations for x :

      a. (10 pts) $25^{2x-3} = 5^{x+1}$

      b. (10 pts) $3 \cdot 2^{x+1} - 4 = 0$

      c. (10 pts) $-2\log_3(-2x+6) = 0$

      d. (10 pts) $P\left(1 + \dfrac{.06}{12}\right)^{12x} = 3P$

      e. (10 pts) $\ln(x-2) + \ln(x+1) = \ln(4)$

8. (20 pts) Sketch the graph of $g(x) = 3 \cdot 2^{x+1} - 4$ by transforming the function $f(x) = 2^x$. Use $x = -1$, $x = 0$, and $x = 1$ to find 3 points in the first graph, and show how these 3 points are moved around by each step in the transformation to $g(x)$. Your final graph should also show the y-intercept and the x-intercept.

9.   (10 pts) Suppose the half-life of a radioactive substance is 500 years. How old is a fire pit, if there is only 12% of the naturally occurring radioactive substance present in a charcoal sample taken from the pit?

10.   (20 pts) Sketch the graph of $h(x) = -2\log_3(-2x + 6)$ by transforming the function $f(x) = \log_3(x)$. Show the points on the first graph that correspond to $x = \frac{1}{3}, 1, 3$, and show how they are moved around by each step in the transformations to $h(x)$. Be sure to show the x-intercept on the final graph. Use as much of the Page 6 as needed.