Simplify the following and write your answer in standard $a + bi$ form.

1. $\sqrt{-45}$

2. $\dfrac{4-2i}{-2-5i}$

3. i^{35}

Solve the following equations for the given variable. If there is more than one solution, separate them with commas.

4. $3u^2 - 10u + 21 = 0$

5. $x^2 - 10x + 10 = 0$
   (by completing the square)
   Form:
   - $(x + \underline{\quad})^2 = \underline{\quad\quad}$
   - $(x - \underline{\quad})^2 = \underline{\quad\quad}$

   Solution

   $x = \underline{\quad\quad}$

6. $2x^2 - 3x + 6 = 0$

Determine all the solutions to the equations below. If there is more than one solution, separate them with commas.

7. $x^4 + 6x^2 - 8 = 0$

8. $3(2^{2x}) + (2^x) - 4 = 0$

9. $log_3(22x - 4) - log_3(x + 1) = 2$

10. $3^{x+1} = 2^{5x-6}$

11. $3^{x^2-3x+1} = 3^{2x-5}$

12. Suppose $R(x)$ is a polynomial of degree 13 whose coefficients are real numbers. Also, suppose that $R(x)$ has the following zeros: $7, -8, 5i, -2 - 4i$.

a) Find another zero of $R(x)$.

b) What is the maximum number of real zeros that $R(x)$ can have?

c) What is the maximum number of non-real zeros that $R(x)$ can have?

d) If the leading coefficient of the polynomial was -3, what can the polynomial look like? Find a polynomial expression that has all the properties mentioned in parts a)-d)

13. Find all the solutions to the equation $10x^6 - 11x^5 - 32x^4 + 56x^3 - 16x^2 - 13x + 6 = 0$, if $x = 1$ is a zero of multiplicity 3.

Solve the following problems. If there is no solution, please state so.

14. A rocket model is launched with an initial velocity of 235 ft/s. The rocket's height h (in feet) after t seconds is given by the following.
$$h = 235t - 16t^2$$
Find all the values of t for which the rocket's height is 151 feet. Round your answers to the nearest hundredth. If there is more than one answer, use or to separate them.

12. A loan of $50,000 is made at 2.5% interest, compounded annually. Assuming no repayment is made, after how many years will the amount due reach $80,000 or more? (Use a calculator if necessary.) Write the smallest possible whole number answer.