Problems given here are examples for some of the material covered in class. However, this list does not represent all the material covered in class. Please refer to the class notes and homework problems for a complete list.

1. Let \( f(x) = 4(x^2 + 1)(x - 2)^3 \). List each zero and its multiplicity. Determine if the graph touches or crosses the \( x \)-axis at each \( x \)-intercept. Determine the maximum number of turning points, and the end behavior of the graph.

2. Solve the following inequalities:
   
   a) \( x^4 < 9x^2 \),  
   b) \( x + \frac{12}{x} \leq 7 \), 
   c) \( \frac{x + 4}{x - 2} \leq 1 \)

3. Find the zeros, including complex zeros if there is any, of \( f(x) = x^3 - 1 \) and write \( f \) in factored form.

4. Let \( f(x) = \frac{1}{x^2} \) and \( g(x) = \frac{1}{x} \). Find the functions \((f \circ g)(x)\), \((g \circ f)(x)\), and their domains.

5. Suppose \( f(x) = \frac{x+1}{x-3} \) is one-to-one. Write an equation for the inverse function \( f^{-1}(x) \).

6. Rewrite the following using multiple logarithms and simplify: \( \log_2 \left( \frac{\sqrt[4]{4} \cdot \sqrt[8]{8} \cdot 3}{\sqrt[16]{16} \cdot \sqrt[8]{8^2}} \right) \).

7. Write the following as a single logarithm: \( -\frac{3}{4} \log_3 16p^4 - \frac{2}{3} \log_3 8p^3 \).

8. Find the domain of \( f(x) = \log_3 \left( \frac{x}{x-1} \right) \).

9. Solve the following equations:
   
   a) \( \sqrt[5]{5} = \left(\frac{1}{5}\right)^{x+2} \),  
   b) \( \log_2(x + 7) + \log_2(x + 8) = 1 \),  
   c) \( 2^{2x} + 2^{x+2} - 12 = 0 \).

10. Suppose $10,000 is invested at an annual interest rate of 5% for 10 years. Find the future value if interest is compounded a) annually, b) quarterly, c) monthly.
11. What rate of interest compounded continuously is required to double an investment in 7 years.

12. The half life of radium is 1690 years. If 40 grams are present now, how much will be present in 310 years?

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1. The only zero is 2 with multiplicity 3. Graph crosses the x-axis at x = 2. Maximum 4 turning points and graph looks like $x^5$ for large values of |x|.

2. a) $(-3, 0) \cup (0, 3)$. BE CAREFUL, the inequality is a strict inequality. Therefore, we cannot include 0 in the solution set and write $(-3, 3)$.
   b) $(-\infty, 0) \cup [3, 4]$, c) $(-\infty, -2)$

3. $(x - 1)(x - \left(-\frac{1 - \sqrt{3}i}{2}\right))(x - \left(-\frac{1 + \sqrt{3}i}{2}\right))$

4. $(f \circ g)(x) = \frac{x}{1-2x}$, $D = \{x|x \neq \frac{1}{2}, x \neq 0\}$, $(g \circ f)(x) = \frac{x}{1-2x}$, $D = \{x|x \neq 2\}$

5. $f^{-1}(x) = \frac{3x+1}{x-1}$, Domain of $f$ = Range of $f^{-1} = \{x|x \neq 3\}$,
   Domain of $f^{-1} = \text{Range of } f = \{x|x \neq 1\}$

6. $-\frac{31}{12}$

7. $-32p^5$

8. $(-\infty, 0) \cup (1, \infty)$

9. a) $x = -\frac{7}{3}$, b) \{-6\}, c) \{1\}.

10. a) $16,288.95$, b) $16,436.19$, c) $16,470.09$.

11. Approximately 10%.

12. Approximately 35.34 grams.