Concurrent Enrollment College Algebra
CE Math 1050
Sample Final Examination 2
Sections 1.6, 3.1 -3.5, 4.3 - 4.5, 5.1 - 5.6, R. 6, 6.1, 6.2 - 6.8, 12.2 - 12.6, 13.1 - 13.3, 13.5

Name:_____

Scientific (not graphing) calculators are allowed. Time limit is 2 hours.
The point value of each problem is in the left-hand margin. **You must show your work to receive any credit**, **except on problems 1** & **2**. Work neatly.

(6 points) 1. True or false.

(   ) $\dfrac{\log_3 12}{\log_3 6} = \log_3 2$.

(   ) $f(x) = 0$ is one-to-one function.

(   ) The domain of the function $f(x) = \sqrt{2-x}$ is $(-\infty, 2]$.

(9 points) 2. Fill in the blank.

(a) The common difference of the arithmetic sequence $2, 5, 8, \ldots$ is

(b) The graph of the function $f(x) = 3x^5 + 4x^2 + x$ may have at most _____ turning points.

(c) The remainder of the division $\dfrac{2x^2 - x + 5}{x + 1}$ is

(10 points) 3. Solve the inequality. Write your answer in interval notation.
$\dfrac{2}{x+2} < \dfrac{1}{x-1}$.

(15 points) 4. Consider the rational function $f(x) = \dfrac{x^2}{x^2 - 1}$.

(a) State its domain.

(b) Find all intercepts of its graph, if any.

(c) Find all asymptotes of its graph.

(d) Determine whether its graph crosses a non-vertical asymptote. **Justify your answer**.

(e) Use the above information and other appropriate points to draw its graph.

(10 points) 5. Find the partial fraction decomposition of the rational expression.

$$\frac{1}{(x+1)(x^2+4)}$$

(10 points) 6. Assume that the following sequence is arithmetic and find the sum using appropriate formulas: $7 + 3 - 1 - 5 - \ldots - 201$.

(10 points) 7. Let $A = \begin{bmatrix} 7 & -9 & 4 \\ 0 & 3 & -1 \\ 2 & -2 & 1 \end{bmatrix}$. Find the inverse A^{-1}.

(10 points) 8. Solve the equation: $\log_8 x^3 - \log_8 2x = 1$.

(10 points) 9. A radioactive isotope that decays according to the function $A(t) = A_0 e^{-0.023t}$, where A is the initial amount present and A is the amount present at time t (in days). Assume that a scientist has a sample of 90 grams of the isotope, when will 60 grams of the isotope be left? **Round your answer to two decimal places**.

(10 points) 10. Use the Binomial Theorem to determine which term of the expansion $(1 - 3b^2)^7$ contains b^6, find it, and simplify it.

(10 points) 11. Solve the system of nonlinear equations: $\begin{cases} x - 2y = 5 \\ x^2 + 3y^2 = 13 \end{cases}$

(10 points) 12. Solve inequality. Write your answer in interval notation. $|3 - 2x| + 1 < 5.$

(10 points) 13. Using an algorithm called insertion sort, a common minicomputer can sort N numbers from least to greatest in t milliseconds where $t = 0.00339N^2 + 0.001143N - 5.95$. How many numbers can the minicomputer sort in 1 second (1000 milliseconds)? **Approximate your answer to the nearest integer**.

(10 points) 14. Let $f(x) = \dfrac{2x - 1}{x + 2}$.

(a) Find the inverse of the function $y = f(x)$.

(b) Determine the range of the function $y = f(x)$.

(10 points) 15. Let $f(x) = 2^{x+1} + 1$.
(a) Determine the domain.

(b) Find all intercepts of its graph, if any.

(c) Find all asymptotes of its graph.

(d) Graph the function $f(x)$ using transformations. Start with graphing $g(x) = 2^x$ and show all steps.