

Concurrent Enrollment College Algebra
CE Math 1050

Sample Final Examination 3

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.

() $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \cdot \begin{bmatrix} 2 & -1 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 2 & -2 \\ 0 & 8 \end{bmatrix}.$

() If $f(x) = \frac{1}{x-1}$ and $g(x) = \frac{2}{x+1}$, then $(f+g)(x) = \frac{3}{2x}$.

() Let $c_1 = -1$ and $c_n = 2c_{n-1} + 1$. Then $c_3 = -1$.

(9 points) 2. Fill in the blank.

(a) The exact value of $3^{\log_3 17}$ is

(b) The minimum value of $y = 2x^2 + 8x - 3$ is $y =$

(c) The domain of the function $f(x) = \sqrt{x+4}$ is

(10 points) 3. Solve the inequality. Write your answer in interval notation.

$\frac{3x^2 + 5x - 2}{x+1} \geq 0.$

(15 points) 4. Consider the rational function $f(x) = \frac{6x}{(x+3)(x-2)}$.

(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.

$$\frac{x-3}{(x+2)(x+1)^2}$$

(10 points) 6. An arithmetic sequence has a common difference equal to 10 and its 6th term to 52.

(a) Find its 15th term.

(b) Use appropriate formula to find the sum of first 15 terms of this sequence.

(10 points) 7. Use matrices (row operations/Gauss elimination) to solve the following system of linear equations. **No points will be given if the system is solved by other methods.**

$$\begin{cases} x + y + z = 7 \\ 2x - y + z = -4 \\ -x + 2y - z = 8 \end{cases}$$

(10 points) 8. Solve the equation. $\log_2(x^2 - x) = 1$.

(10 points) 9. Suppose John has \$4,000 to invest and wants \$5,000 to buy a hot tub. He finds a bank offering 5.5% interest compounded quarterly. How long will he have to leave his money in the account to have \$5,000? **Round your answer to one decimal place.**

(10 points) 10. Find the sixth term of the expansion of $(1 - 2a^2)^7$ using the Binomial Theorem, and simplify it.

(10 points) 11. Solve the system of nonlinear equations: $\begin{cases} xy = 12 \\ x + y = 7 \end{cases}$

(10 points) 12. Solve equation. $|3x + 2| - 7 = 8$.

(10 points) 13. Your factory produces lemon-scented widgets. You know that each unit is cheaper, the more you produce. But you also know that costs will eventually go up if you make too many widgets, due to the costs of storage of the overstock. The guy in accounting says that your cost for producing x thousands of units a day can be approximated by the formula $C = 0.04x^2 - 8.504x + 25302$.

(a) Find the daily production level that will minimize your costs. **Round your answer to one decimal place.**

(b) What is the minimum daily production cost?

(10 points) 14. Let $f(x) = \frac{x}{x+1}$ and $g(x) = \frac{1}{x+1}$.

(a) Find the quotient $(\frac{f}{g})(x)$ and simplify it.

(b) Find the domain of the function $(\frac{f}{g})$ and state the answer in the set notation.

(10 points) 15. Let $f(x) = 3^{x+1} - 1$.

(a) Determine the domain

(b) Find all intercepts of its graph.

(c) Find all asymptotes of its graph.

(d) Graph the function $f(x)$ using transformations. Start with graphing $g(x) = 3^x$ and show all steps.