

Extra Examples for FINAL 2019:

1. (6 points) Consider the function  $g(x) = \frac{3x^2+2}{x^2+2x-8}$ . Write your answer(s) in equation form.

a. The vertical asymptote(s), if any, of the function  $g(x)$  is (are)

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b. The non-vertical asymptote(s), if any, of the function  $g(x)$  is (are)

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2. (3 points) Consider the system of linear equations: 
$$\begin{cases} 2x + 4y - z = 3 \\ -x + y - 4z = 0 \\ 4x + 7y + z = -1 \\ x + y + 6z = 10 \end{cases}$$
 What is a valid first step to

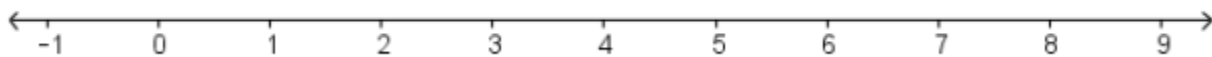
find the solution of the given system of linear equations using matrices (row operations)?

3. (3 points) Let  $f(x) = x^4 - 8$ . What is the inverse  $f^{-1}$ ?

4. (2 points) Write 2 correct ways to write the intervals in **interval notation** marked on the number line below.



5. (2 points) The rational expression  $\frac{4-x}{x^2-8x+12}$  has critical numbers at  $x = 2, x = 4$  and  $x = 6$ . Find the solution to the inequality  $\frac{4-x}{x^2-8x+12} \geq 0$ . Graph solution on number line.

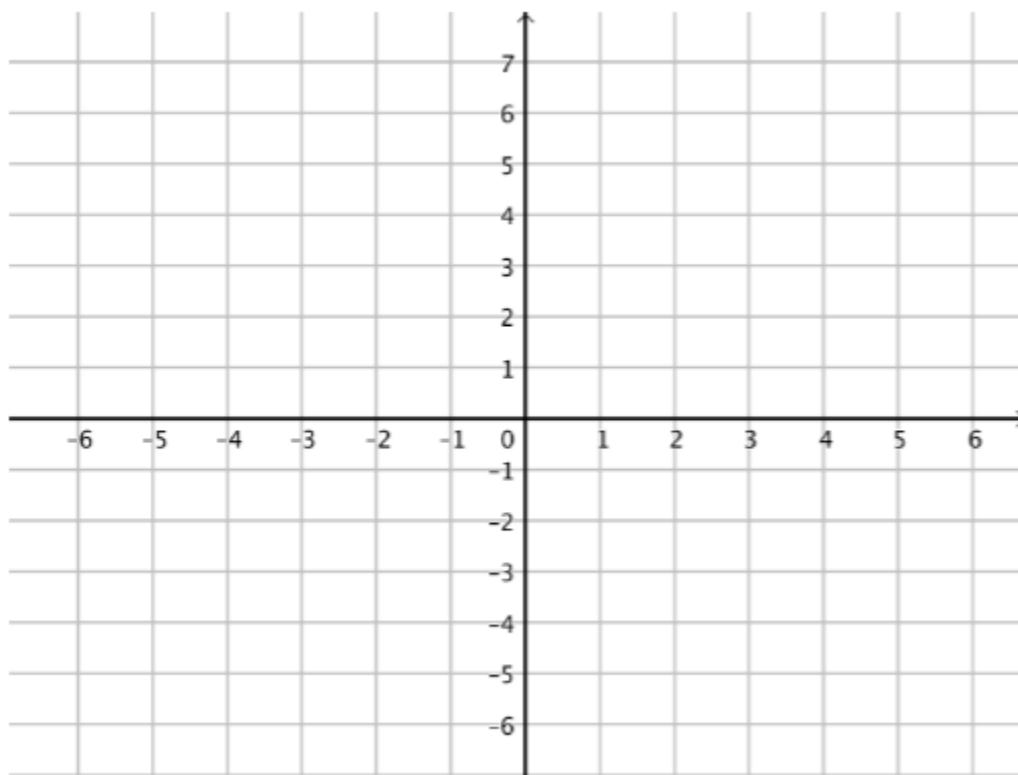


6. (4 points) Consider the function:  $f(x) = \log_2(x + 3)$

a. What is the domain of  $f$ ?

b. What is the intercept of  $f$ ? Write your answer as an ordered pair.

7. (9 points) Graph the rational function  $f(x) = \frac{x^2}{x-4}$ . Your graphs should clearly show and label all x and y-intercept(s) and all asymptotes.



8. (2 points) Multiply:  $\begin{bmatrix} -1 & 4 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 9 & -3 \\ 6 & 1 \end{bmatrix}$

9. (2 points) The graph of the function  $f(x) = 5x^8 + 6x^4 - 3$  has at most \_\_\_\_\_ turning points.

10. (3 points) If  $\log_b x^4 = 7$ , evaluate  $\log_b x$ .

11. (3 points) Write an expression to find the term containing  $a^8$  in the expansion  $(6a - 1)^{37}$ . Do not simplify.

12. (3 points) If  $f(x) = \frac{3x+5}{x-3}$  and then  $f^{-1}(x) = \frac{3x-5}{x-3}$ . The range of  $f$  is \_\_\_\_\_.

For problems 13-14, consider the function  $g(x) = \frac{4x^2+3}{x^2+2x-15}$

13. (3 points) The vertical asymptote(s), if any, of the function  $g(x)$  is (are) \_\_\_\_\_.  
Write your answer(s) as equation(s).

14. (3 points) The non-vertical asymptote(s), if any, of the function  $g(x)$  is (are) \_\_\_\_\_.  
Write your answer(s) as equation(s).

15. (3 points) Given the table:

$x$	-3	-2	-1	0	1	2	3
$f(x)$	-7	-5	-3	-1	3	5	7
$g(x)$	8	3	0	-1	0	3	8

Evaluate  $(g \circ f)(3)$  \_\_\_\_\_.

16. (3 points) The maximum value of the function  $f(x) = -x^2 - 3x + 7$  is:  $y =$  \_\_\_\_\_.

17. (3 points) How long will it take an initial investment of \$1000 to be worth \$6500 if the investment **compounds continuously** at an annual interest rate of 4%? Round your answer to the nearest tenth of a year.

18. (4 points) The form of the partial fraction decomposition of the rational function  $f(x) = \frac{4x+1}{x(x+3)^2}$  is:

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19. (4 points) Let  $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ -1 & 0 & -4 & 3 \\ 2 & 2 & 1 & -1 \end{bmatrix}$ . Some row operation(s) have been applied to  $A$  to obtain  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ -5 & -8 & x & y \\ 2 & 2 & 1 & -1 \end{bmatrix}$ . What are the values of  $x$  and  $y$ ?

20. (4 points) Find the remainder:  $\frac{5x^2+7x-3}{x+1}$

21. (7 points) Assume the following sequence is arithmetic. Find the sum using appropriate formulas.  
 $4 - 1 - 6 - 11 - 16 - \dots - 126$

22. (5 points) Let  $f(x) = \frac{3x+5}{x-3}$ . Find the inverse of  $f$  and simplify completely.