College Algebra - Test 1 **Name:** ____________________

1. (5 points) Suppose $g(x) = \left\{ \begin{array}{ll} 3x + 8 & \text{if } x < -2 \\ \sqrt{4 - x^2} & \text{if } -2 \le x < 0 \\ \sqrt{x} & \text{if } x \ge 0 \end{array} \right\}$.

   Evaluate the piecewise defined function at the values indicated below.

   (a) $g(-3)$ (a) ____________

   (b) $g(-2)$ (b) ____________

   (c) $g(-1)$ (c) ____________

   (d) $g(0)$ (d) ____________

   (e) $g(4)$ (e) ____________

2. (4 points) Sketch the graph of the piecewise function defined above.

3. (5 points) Write the domain of $f(x) = \dfrac{1}{4x-3}$ using interval notation.

3. ___________

4. (5 points) Write the domain of $f(x) = \sqrt{1-3x}$ using interval notation.

4. ___________

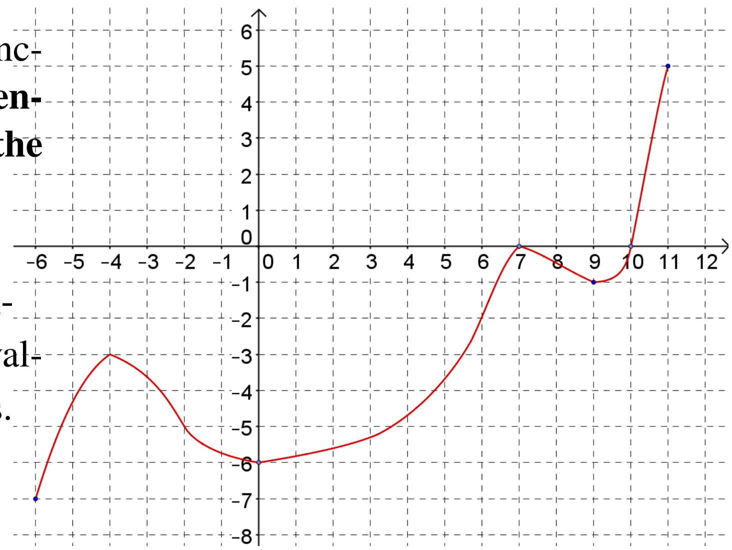
5. (5 points) Find f/g and its domain. $f(x) = \dfrac{2}{x-3}$ and $g(x) = \dfrac{x}{2-x}$

5. ___________

6. (5 points) Find the average rate of change of $f(x) = 5x^2 - 2x$ from $x_1 = 3$ to $x_2 = 4$

6. ___________

7. (12 points) The graph of a function f is given. **Assume the entire graph of f is shown in the figure.**



(a) Find all ***local*** and absolute maximum and minimum values of the function and the value of x at which each occurs.

(b) State the x intervals for which $f(x) > 0$.

(c) State the x intervals for which $f(x) < 0$.

(d) Find the x intervals on which the function is ***increasing***.

(e) Find the x intervals on which the function is ***decreasing***.

(f) Find $f(-4)$. (f) ____________

(g) Find $f(9)$. (g) ____________

Directions: Sketch the graph of the function, not by plotting points, but by starting with the graph of a standard function and applying transformations. Label at least 3 points on your final graph.

8. (5 points) $h(x) = -3\left|x + 3\right| + 4$

Find $f \circ g$ its domain.

9. (5 points) $f(x) = \sqrt{x+4}$ and $g(x) = x^2$.

10. (5 points) Find the inverse function of $f(x) = \sqrt[3]{x+3}$

10. __________

Math 110 – Exam 2 **Name:** ____________________

Directions: You are NOT allowed to use a calculator, computer, textbook or person as help on this Test. Show ALL of your work on ALL of the questions if you want full credit. Scratch paper is not allowed. Tutor help is not okay.

Use $f(x) = x^5 - x^4 - 5x^3 + x^2 + 8x + 4$ **for questions 1 through 8.**

1. (5 points) Find all the zeros of $f(x)$. What is the multiplicity of each root?

1. __________

Test 2

2. (2 points) Write the complete factorization of $f(x)$ here.

2. ___________

3. (2 points) What is the domain of $f(x)$?

3. ___________

4. (2 points) Find the y-intercept of $f(x)$

4. ___________

5. (2 points) Write an end behavior description for $f(x)$

5. ___________

Test 2

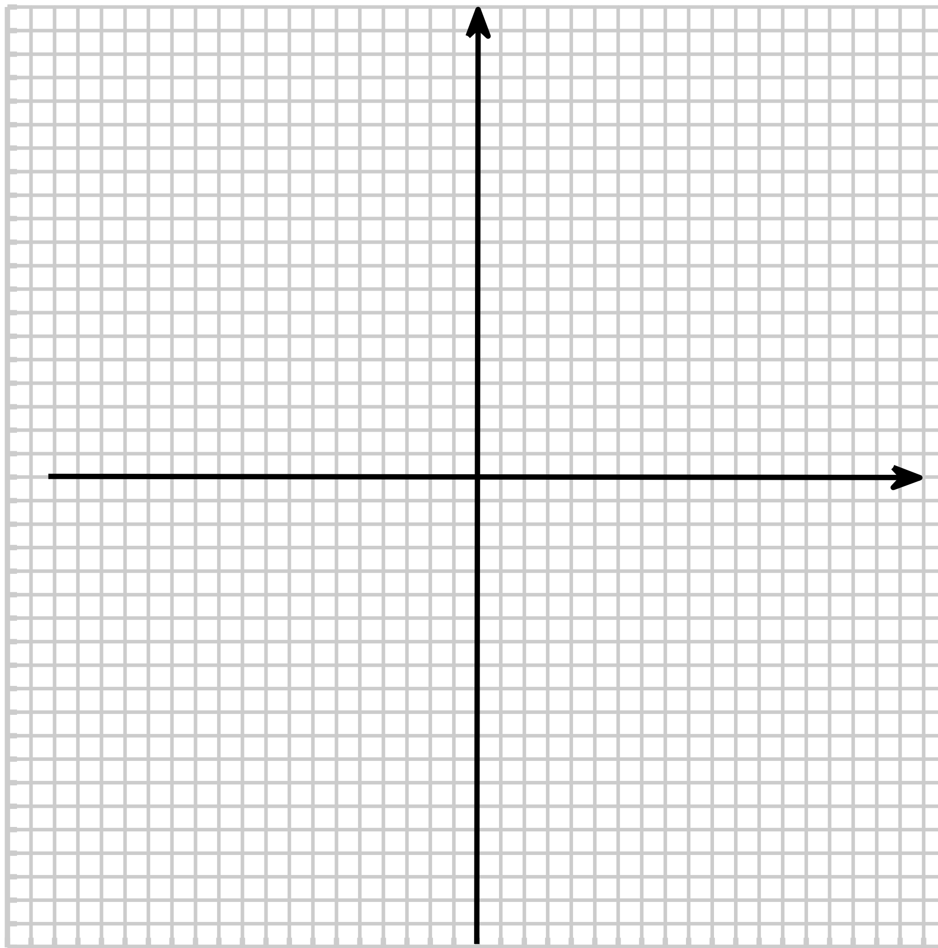
6. (2 points) Find the solution set to $f(x) > 0$

6. ___________

7. (2 points) Find the solution set to $f(x) < 0$

7. ___________

8. (3 points) Graph $f(x) = x^5 - x^4 - 5x^3 + x^2 + 8x + 4$



For questions 9 through 16, use $f(x) = \dfrac{x-1}{x^3-4x}$

9. (2 points) Find the vertical asymptote(s) of $f(x)$ 9. ____________

10. (2 points) Find the domain of $f(x)$ 10. ____________

11. (2 points) Find the x-intercept(s) of $f(x)$ 11. ____________

Test 2

12. (2 points) Find the y-intercept of $f(x)$ 12. ____________

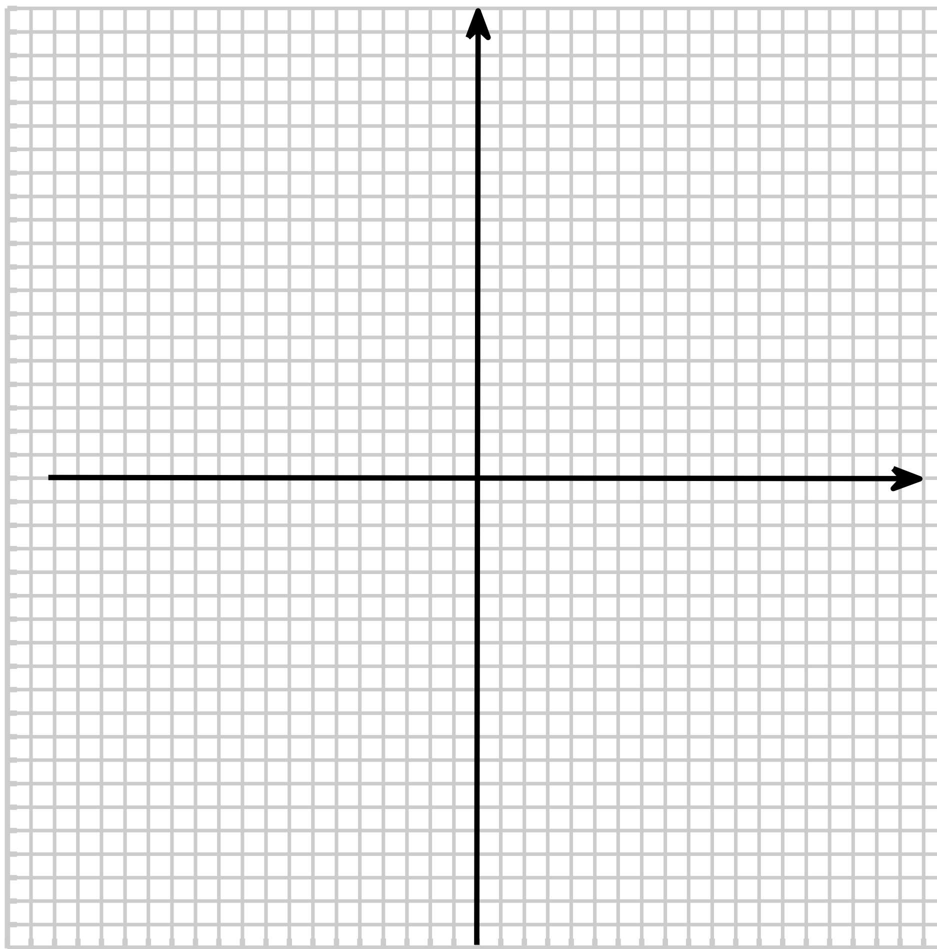
13. (2 points) Find the horizontal asymptote of $f(x)$ 13. ____________

14. (2 points) Find all x values for which $f(x) > 0$ 14. ____________

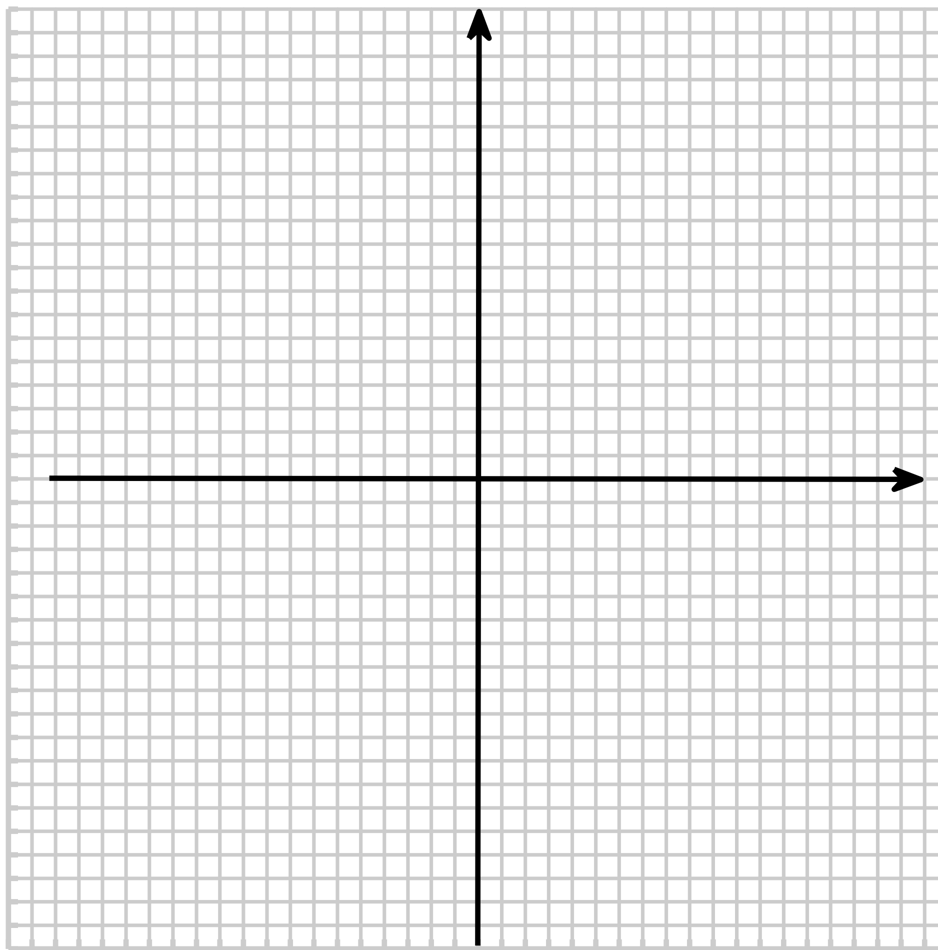
15. (2 points) Describe the behavior of the graph of f around its vertical asymptote(s). Use the arrow notation taught in class.

15. ____________

16. (4 points) Graph $f(x) = \dfrac{x-1}{x^3-4x}$



17. (5 points) Graph $f(x) = \dfrac{2x^2 - x - 3}{x - 2}$



18. (4 points) Find the quotient and the remainder for $\dfrac{x^4 - 16}{x^2 + 3x + 1}$

18. ___________

Test 2

Find a mathematical model that represents the statement. Then determine the value of the constant of proportionality, k.

19. (4 points) z varies jointly as x and y. It is known from experimental results that $z = 64$ when $x = 4$ and $y = 8$.

19. ___________

Find a mathematical model for the verbal statement.

20. (2 points) y varies inversely as the square of x.

20. ____________

21. (4 points) Find a polynomial with real coefficients that has zeros at $x = 2$ and $x = 3 - 2i$. Write the polynomial in descending order (leaving your polynomial in factored form doesn't constitute a full credit answer).

21. ____________

Test 2

Use $g(x) = 3x^2 + 2x - 7$ to answer questions 22 through 28.

22. (4 points) Use the quadratic formula to find the zeros of

$$g(x) = 3x^2 + 2x - 7$$

Test 2

23. (3 points) Estimate the value of each root without a calculator.

24. (4 points) Express the quadratic function $g(x) = 3x^2 + 2x - 7$ in standard (vertex) form.

25. (1 point) Find the vertex of $g(x) = 3x^2 + 2x - 7$. Does f open up or down?

Test 2

25. ____________

26. (2 points) What is the range of g?

26. ____________

27. (3 points) For what x values is the graph of g below the x axis?

27. ____________

28. (2 points) Find the solutions to the inequality $g(x) > 0$.

28. ____________

Math 110 **Test 3** **Name:** ____________________

No Calculators or Computing Devices on this section. Once you turn this section in, you may NOT have it back! Use Algebraic Notation AND Show All of Your Work.

---

1. (5 points) **Find the standard form of the equation of the parabola with the given characteristic(s).**

   Vertex: $(x, y) = (-1, 2)$; focus: $(-1, 0)$

   1. __________

2. (5 points) **Write the equation of a circle in standard form, and <u>then find its center and radius</u>.**

   $$x^2 + y^2 - 4y = 0$$

   2. __________

3. (6 points) **Identify the conic by writing its equation in standard form, then sketch its graph. Be sure to label foci, asymptotes and vertices on your graph if that is appropriate.**

$$y^2 - x^2 + 4y = 0$$

3. ___________

4. (5 points) This is a ***Matching question*** associated with the theory on graphical translations of functions. Suppose $f(x) = 3^x$. Relative to the graph of $f(x)$ the graphs of the following functions have been changed in what way?

____	$g(x) = -3^x$	a.) shifted 5 units right
____	$g(x) = 3^{(x+5)}$	b.) reflected about the x axis
____	$g(x) = 3^x + 5$	c.) shifted 5 units left
____	$g(x) = 3^{(x-5)}$	d.) shifted 5 units down
____	$g(x) = 3^x - 5$	e.) shifted 5 units vertically up

5. (4 points) **Use the One-to-One Property to solve the equation for x.**

$$3^{2x-3} = \frac{1}{81}$$

5. ___________

6. (5 points) Sketch the graphs of $f(x) = 2^x$ and $g(x) = \log_2(x)$ in the same coordinate system, and then tell me what the domain and range of each function is.

7. (1 point) What number is $\log_7(49)$ equal to? 7. ___________

8. (1 point) What number is $\log_5(\sqrt{5})$ equal to? 8. ___________

9. (1 point) What number is $\ln(e^3)$ equal to? 9. ___________

10. (1 point) What number is $\ln(e^3)$ equal to? 10. ___________

11. (1 point) What equation represents the vertical asymptote for

$$f(x) = \log_2(x)$$

11. ____________

12. (5 points) Condense the following expression to the logarithm of a single quantity.

$$\frac{1}{3}\Big[\log_8 y + 2\log_8(y+4)\Big] - \log_8(y-1)$$

13. (4 points) Solve the equation.

$$\log_7(x-3) + 1 = 2$$

13. ____________

14. (5 points) Use the method of substitution to solve the system

$$\begin{cases} 3x^2 + 4x - y = 7 \\ \qquad 2x - y = -1 \end{cases}$$

15. (5 points) Solve the system $\begin{cases} x - 2y = 3 \\ -2x + 4y = 1 \end{cases}$

15. ____________

16. (5 points) Solve the system $\begin{cases} 2x - y = 1 \\ 4x - 2y = 2 \end{cases}$

16. ____________

Calculator Section **Name:** ____________________

Directions: After you turn this in, please pick up the no-calculator section of the exam, which has 12 questions. You are allowed to take THIS paper back to work on or double check your work, AFTER you turn in the no-calculator section of the exam.

17. (5 points) The number of bacteria in a culture is increasing according to the law of exponential growth. After 3 hours, there are 100 bacteria, and after 5 hours there are 600 bacteria. How many bacteria will there be after 8 hours

17. __________

Test 4 – Review **Name:** ____________________

No Calculators or Computing Devices allowed! Use Algebraic Notation AND Show All of Your Work.

---

1. (6 points) Use Gaussian elimination to find the complete solution of the system, or show that no solution exists.

$$\begin{cases} x + y + z = 0 \\ x - y + z = 0 \\ x - y - z = 0 \end{cases}$$

1. __________

2. (6 points) Use Matrices and Elementary Row Operations to find the complete solution of the system, or show that no solution exists.

$$\begin{cases} x - 2y - 3z = -1 \\ 2x + y + z = 6 \\ x + 3y - 2z = 13 \end{cases}$$

2. ____________

3. (a) (2 points) Write a matrix equation equivalent to the following system.

$$\begin{cases} 2x + 3y = 2 \\ x - 2y = 8 \end{cases}$$

(a) ____________

(b) (4 points) Find the inverse of the coefficient matrix, and use it to solve the system.

(b) ____________

4. (5 points) Solve $\begin{Bmatrix} 2x + 5y = 16 \\ 3x - 7y = 24 \end{Bmatrix}$ using Cramer's Rule.

4. ____________

5. Let $A = \begin{bmatrix} 1 & -5 \\ -3 & 7 \end{bmatrix}$, $\quad B = \begin{bmatrix} 2 & 7 \\ 1 & 0 \end{bmatrix}$, $\quad C = \begin{bmatrix} 1 & 3 & 1 \\ -2 & 7 & 2 \end{bmatrix}$

Carry out the indicated operation, or explain, using complete sentences, why it cannot be performed.

(a) (4 points) $\quad 2A + B$

(b) (4 points) $\quad BC$

(c) (2 points) $\quad C^{-1}$

(d) (2 points) $\quad \det(C)$

6. (6 points) Find the partial fraction decomposition of $\dfrac{x-2}{x^2-6x+5}$.

6. ____________

7. Only one of the following two matrices has an inverse.

$$A = \begin{bmatrix} 3 & 1 & -2 \\ 4 & 2 & 5 \\ -6 & 3 & -1 \end{bmatrix}, \qquad B = \begin{bmatrix} 3 & 0 & 0 \\ 2 & 5 & -5 \\ 1 & -6 & 6 \end{bmatrix}$$

(a) (5 points) Find the determinant of each matrix. (a) ___________

(b) (1 point) Use the determinants from part (a) to identify which matrix has an inverse.

(b) ___________

8. (6 points) Sketch the graph (and label the vertices, or boundary intersections) of the solution set of ordered pairs of the system.

$$\begin{cases} 3x + y < 3 \\ 4 - y < 2x \end{cases}$$