

**Math 1043: College Algebra,
Abedi, Final Examination Study Guide**

Some useful formulas:

$$i) A = P\left(1 + \frac{r}{k}\right)^{kt} \quad ii) A = Pe^{rt} \quad iii) A = A_0 2^{\frac{-t}{h}} \quad iv) R = \log \frac{A}{P} \quad v) t = \frac{\ln 2}{r}$$

1. The dimension of the matrix $A = \begin{bmatrix} -1 & 2 \\ 2 & 0 \\ 1 & -3 \end{bmatrix}$ is _____.

2. Find $2 \begin{bmatrix} 0 & 2 \\ -1 & 4 \\ 5 & 0 \end{bmatrix} - 3 \begin{bmatrix} 0 & 2 \\ 1 & 1 \\ -1 & 2 \end{bmatrix}$.

3. Find the set of all solutions of the system $\begin{cases} 2x + z = 4 \\ 3y - 2z = 6 \\ 3z = 0 \end{cases}$.

4. Express the system $\begin{cases} x - 2y + 3z = 1 \\ x + 2y = 5 \\ 3x + y = 0 \end{cases}$ in matrix equation form $AX = B$ and solve the system.

(Use your calculator to find A^{-1} , then $X = A^{-1}B$.)

Solve the above system using the Cramer's rule.

5. Find the number of solutions of the system with augmented matrix $\left[\begin{array}{ccc|c} 1 & 0 & -2 & 1 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right]$.

Solve the system, find the general solutions if it has many solutions.

6. Let $f(x) = \sqrt{x+2}$ and $g(x) = x^2 - 4$.

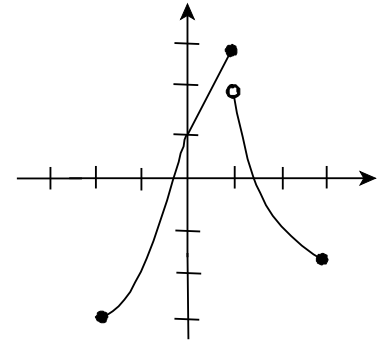
Find the domain of $f(x)$ _____. Find the range of $f(x)$ _____

Find: $g(-5) =$ _____ $(g \circ f)(7) =$ _____

$(f + g)(x)$ _____ $(f - g)(7)$ _____

Graph both f and g .

7. Consider the figure on the right:



i) Find the domain of $h(x)$.

ii) Find the range of $h(x)$.

iii) Find $h(-1) = \underline{\hspace{2cm}}$, $h(0) = \underline{\hspace{2cm}}$, $h(3) = \underline{\hspace{2cm}}$, $h(-2) = \underline{\hspace{2cm}}$

iv) If $h(x) = 3$, then $x = \underline{\hspace{2cm}}$

8. Consider the parabola $y = -2x^2 + 12x - 14$

i) Find the x -coordinate of the vertex of the parabola. Find the vertex.

ii) Find the x -intercept(s) of the parabola

iii) Find the y -intercept(s) of the parabola

9. Find the right-hand and the left-hand behavior of the graph of polynomial $P(x) = 8x^5 + 3x^3 - x^2 - 4x + 7$

10. If $\log_2(x + 2) = 4$, then $x = \underline{\hspace{4cm}}$

11. If $5^{x-1} = 9$, then $x = \underline{\hspace{4cm}}$

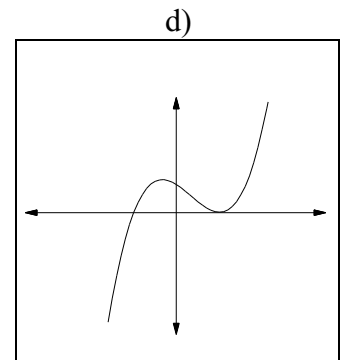
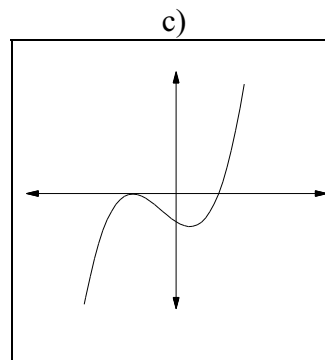
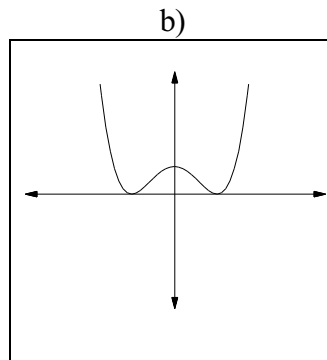
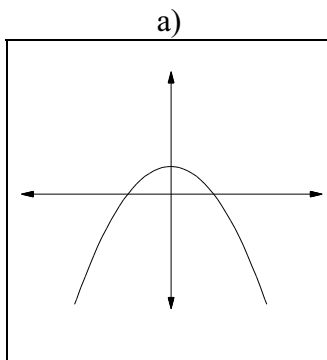
12. A total amount of \$1000 is invested at 6.5% interest compounded quarterly ($n = 4$). Find the balance after three years.

13. Determine which of the following functions has an inverse? {Hint: Consider the graphs of the functions}

a) $f(x) = x^3$ b) $g(x) = |x|$ c) $h(x) = x^2$ d) $p(x) = 4$

14. Let $f(x) = 2x - 4$, find $f^{-1}(x)$

15. Which of the following graphs best represents the function $f(x) = 20(x + 1)^2(x - 1)$



16. Find all the zeros of $f(x) = 3x^2(x + 4)(2x - 4)^5$

17. Find the y-intercept of $f(x) = 3x^2(x - 5)(8x + 9)^3$.

18. The domain of the function $f(x) = \frac{2(x^2 + 1)}{x^2 - 1}$ is the set of all real numbers **except** _____

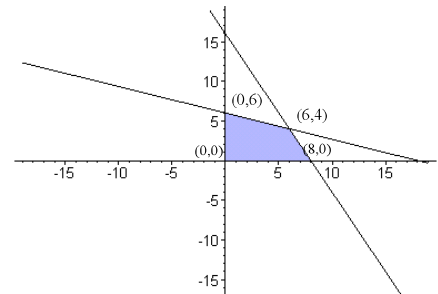
19. Find the horizontal asymptote of the function $f(x) = \frac{2(x^2 + 1)}{x^2 - 1}$ _____

20. A mold population fits the model $A(t) = 1000 e^{0.3t}$, where t is time measured in days. How many days will it take the mold population to reach 2,000 ?

21. Solve the following system and graph the equations. Label the points of intersections.

$$\begin{cases} x - y = 1 \\ -4x + 6y = -1 \end{cases}$$

22. Find the maximum and the minimum values of the function $C = 3x - 2y + 50$ over the shaded region (below) .



23. An automobile manufacturer builds SUV's and luxury cars in the same facility. The SUV's require \$3,000 in materials and \$2,000 in labor per vehicle to build and sell for a profit of \$5,000 each. The luxury cars require \$2,000 in materials and \$3,000 in labor per car to build and sell for a profit of \$4,000 each. \$600,000 is budgeted for materials and \$600,000 is budgeted for labor per week. We wish to determine the number of each type of vehicle the manufacturer should build to maximize the weekly profit. Let x be the number of SUV's built and let y be the number of luxury cars built.

- a) Graph the region of feasible solutions.
- b) How many of each type should be built to maximize profit? What is the maximum profit?

37. Sketch the solution space of the following system of linear inequalities, labeling the intersection and intercepts of the boundary lines.

$$\begin{cases} 3x + 2y \leq 6 \\ 3x - 2y \geq -6 \end{cases}$$

38. Evaluate: $\frac{6! - 3!}{5!}$

39. In the ninth term of $(a + b)^{13}$, find the exponent of a .

40. Find the coefficient of the third term in the expansion of $(3x - y)^5$.

41. What is the sum of the numbers in the 7th row of Pascal's triangle?

42. Suppose that the following represents one row in Pascal's triangle

$$1 \quad a \quad 2a \quad 3a \quad 4a \quad . \quad . \quad . \quad 4a \quad 3a \quad 2a \quad a \quad 1$$

Find the fifth number from the left in the next row.

43. Find the third term in the expansion of $(x - y)^{12}$.

44. Expand the binomial $(3x - 2y)^4$.