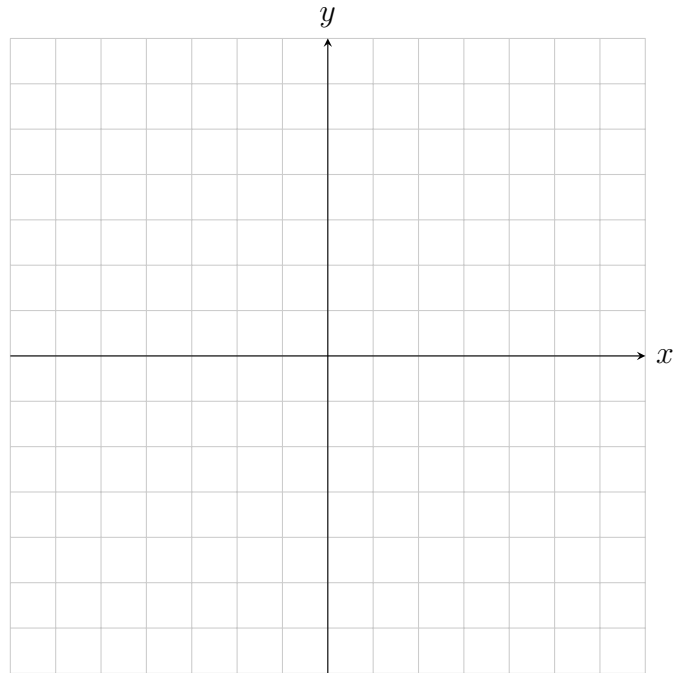


3 pts 1. What is the definition of a solution to a system of equations in two variables?

7 pts 2. Identify the slope and  $y$ -intercept of the following equations and then use them to solve the system of equations by graphing. Remember to label the  $y$ -intercepts and the intersection of the lines. Write your solution in set notation.

$$3y - x = 6$$

$$3y = 4x - 12$$



6 pts 3. Let  $x$  represent the first number and let  $y$  represent the second number. Suppose that twice the first number, increased by 5 times the second number results in 12. Further assume the first number equals  $-\frac{5}{2}$  of the second number, increased by 6. Use the given conditions to write a system of equations and then solve that system using the substitution method. Write the solution in set notation.

2 ea 4. Identify each polynomial as a monomial, a binomial or a trinomial. Give the degree of the polynomial.

a. 15

b.  $324x^3 - 9y^{192} + 13$

3 pts 5. Add or subtract the following polynomials:

a.  $\left(\frac{2}{3}x^3 + \frac{1}{5}x - \frac{3}{4}\right) - \left(-\frac{2}{3}x^3 - \frac{3}{4}x + \frac{3}{4}\right)$

3 ea 6. Multiply the following expressions.

a.  $(-3x^2y^6)(5x^2y^{15})$

b.  $\left(3x - \frac{1}{6}\right)(12x^3 - 18x^2 + 30x)$

3 ea 7. Simplify the following expressions by using the exponent rules gone over in class. Final forms should have only positive exponents.

a.  $(-9xyz)^0$

c.  $\left(\frac{15y^{-4}}{25x^2}\right)^{-3}$

b.  $\frac{12z^3 - 6z^2 + 24z}{6z}$

3 ea 8. Simplify the following expressions using scientific notation. Write the simplified form in scientific notation.

a.  $(3 \times 10^7)(5 \times 10^{-23})$

b.  $(2 \times 10^3)^5$

- 2 ea 9. The functions  $f$ ,  $g$ , and  $h$  are given below. Use the appropriate function to evaluate or solve as requested below. State solutions to equations you are solving using set notation in a complete sentence.

- |        |    |    |   |   |   |     |
|--------|----|----|---|---|---|-----|
| $x$    | -5 | -1 | 0 | 2 | 8 | 13  |
| $f(x)$ | 7  | -4 | 5 | 1 | 0 | -16 |

- $h(x) = 3x - 1$

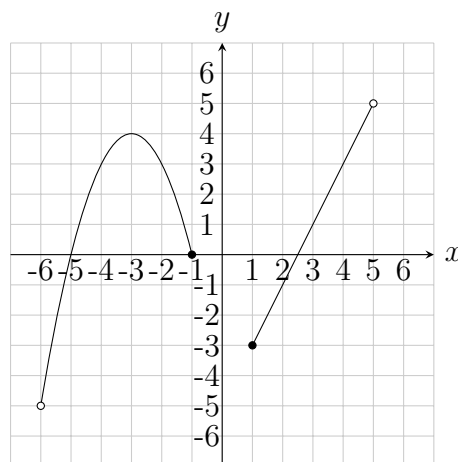


Figure 1:  $y = g(x)$

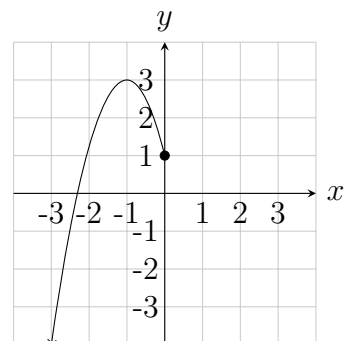
- a.  $f(0)$
- b.  $h(-2)$
- c.  $g(2)$
- d. Solve  $f(x) = -16$ .
- e. Solve  $g(x) = 3$ .
- f. Solve  $h(x) = -1$ .

- 2 pts 10. Suppose you have a function  $M$  with  $M(2) = -1$  and  $M(-3) = 5$ . What are two points on the graph of  $M$ ?

- 3 pts 11. What is the definition of a solution to an equation in one variable?

3 ea 12. Determine which of the following relationships between inputs and outputs can be categorized as a function and justify your response. State the domain and range of the relations.

a.  $\{(-3, 4), (1, -4), (0, 0), (2, 4), (-3, 5)\}$  b.



3 ea 13. What is the one requirement for a relationship between inputs and outputs to be considered a function?

4 pts 14. Solve the equation  $\frac{2}{3}x - 1 = -\frac{1}{3}x + 2$  numerically. Define a function to represent each side of the equation and use function notation in your table headings as appropriate. State a conclusion using set notation in a complete sentence. **Note: You will receive zero points for solving this equation symbolically.**


- 7 pts 15. Solve the equation  $\left| -\frac{1}{2}x + 2 \right| \geq 3$  graphically. Define a function to represent each side of the equation and label each functions graph appropriately. Label any  $x$  or  $y$  intercepts along with any intersection points. State a conclusion using set notation in a complete sentence. **Note: You will receive zero points for solving this equation symbolically.**



- 7 pts 16. Solve the following equations symbolically. **Part of your grade for these problems is to *justify* breaking up the absolute value inequalities.** State a conclusion using interval notation within a complete sentence.

a.  $2|3x + 3| \leq 5$

17. Determine the domain and range of the following functions. State your conclusions using both set and interval notation.

a.  $f(x) = \sqrt{1 + 2x^2}$

b.  $f(x) = \frac{1}{\sqrt{x-1}}$

18. Determine the domain and range of the following functions. State your answers in both set and interval notation.

a.  $f(x) = \sqrt[4]{x+2}$

b.  $f(x) = \sqrt[3]{x-2} + 3$

19. Use positive rational exponents to simplify the expression. Assume that all variables are positive.

a.  $(x^2)^{3/2}$

c.  $\sqrt{y^3} \cdot \sqrt[3]{y^2}$

b.  $\sqrt[3]{x^3y^6}$

d.  $\left(\frac{x^6}{27}\right)^{2/3}$

e.  $\sqrt{\sqrt{y}}$

g.  $p^{1/2}(p^{3/2} + p^{1/2})$

f.  $\sqrt{b} \cdot \sqrt[4]{b}$

h.  $\sqrt[3]{x}(\sqrt{x} - \sqrt[3]{x^2})$

20. Simplify the expression assuming that all variables are positive.

a.  $\sqrt{\frac{1}{2}} \cdot \sqrt{\frac{1}{8}}$

c.  $\sqrt{\frac{x}{2}} \cdot \sqrt{\frac{x}{8}}$

b.  $\sqrt[4]{\frac{x}{81}}$

d.  $\sqrt{200}$



e.  $\sqrt[5]{-64}$

j.  $\sqrt[3]{16} + 3\sqrt[3]{2}$

f.  $\sqrt{12a^2b^5}$

k.  $\sqrt{2} + \sqrt{18} + \sqrt{32}$

g.  $\sqrt[3]{-125x^4y^5}$

l.  $\sqrt[4]{48} + 4\sqrt[4]{3}$

h.  $\sqrt{\frac{7a^2}{27}} \cdot \sqrt{\frac{7a}{3}}$

m.  $3\sqrt{2k} + \sqrt{8k} + \sqrt{18k}$

i.  $\sqrt[4]{rt} \cdot \sqrt[3]{r^2t}$

n.  $2\sqrt[4]{64} - \sqrt[4]{324} + \sqrt[4]{4}$

21. Rationalize the denominator.

a.  $\frac{1}{\sqrt{7}}$

c.  $\frac{\sqrt{7} - 2}{\sqrt{7} + 2}$

b.  $\frac{1}{3 - \sqrt{2}}$

d.  $\frac{\sqrt{z}}{\sqrt{z} - 3}$

22. Factor the following polynomials.

a.  $36x^4 - 4x^6$

b.  $z^3 + 64$

23. Solve each of the following quadratic equations. Describe the set of solutions in set notation.

a.  $(3x - 5)^2 = 64$

b.  $3x^2 + 11x = 4$

c.  $x^2 - 6x - 11 = 0$

24. Solve the equation symbolically. State your conclusion using set notation in a complete sentence.

a.  $2\sqrt{x-2} + 1 = 5$

b.  $\sqrt{x} = \sqrt{x-5} + 1$

### Graphical Solutions:

25. Solve the equations graphically using your calculators graphing capabilities. Define  $y_1(x)$  and  $y_2(x)$  for each and then state the solution(s) in set notation. Approximate solutions to the nearest hundredth when appropriate.

(a)  $\sqrt[3]{x+5} = 2$

$y_1(x) =$

$y_2(x) =$

The set of solutions is:

(b)  $\sqrt{x+2} + \sqrt{3x+2} = 2$

$y_1(x) =$

$y_2(x) =$

The set of solutions is:

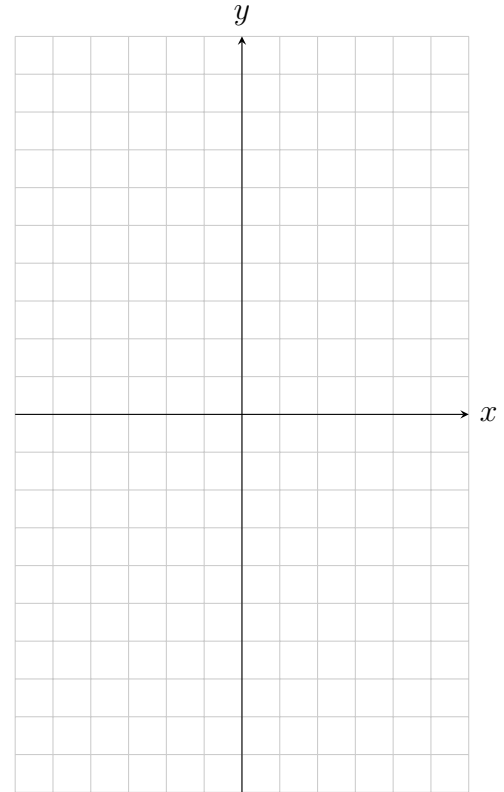
26. Suppose  $f(x) = x^2 - 2x - 8$ . Answer the following questions. Remember to label all of the points shown in the table and also the equation of the axis of symmetry when you graph the function.

a. Does the graph open up or down?

c. Graph the function.

b. Complete the table with the points needed to sketch a graph of  $f(x)$ . Write the name of each key point in the blanks provided. Show your work in the space below.

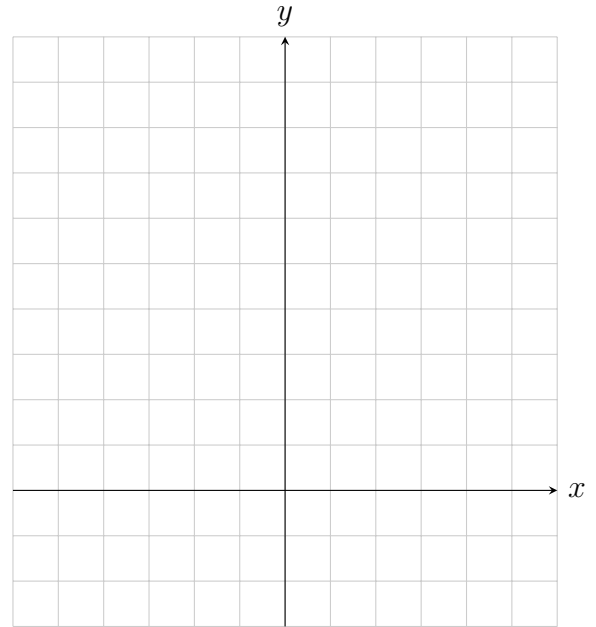
Name of point	$x$	$f(x)$
_____		
_____		
_____		
_____ {		



27.

- 10 pts a. Make a table for  $f(x) = (x - 2)^2 - 3$  then graph  $y = f(x)$  in the space provided with the vertex in the middle. Label all points from the table along with the axis of symmetry.

$x$	$f(x)$



- 4 pts b. Describe using a complete sentence how the function  $sqr(x) = x^2$  is translated to become  $f$ .

- 10 pts 28. Complete the square of the following function to put it into vertex form. Then state the vertex.

$$f(x) = 3x^2 - 12x + 1$$

- 10 pts 29. Solve

$$g(x) = 0, \text{ where } g(x) = 2x^2 - 4x + 5,$$

by completing the square. If your answer is complex, write it in standard complex number form and state your conclusion using set notation in a complete sentence.

- 6 pts 1. The half-life of Uranium 234 is  $2.5 \times 10^5$  years and the half-life of Plutonium is  $8.0 \times 10^7$  years. How many times greater is the half-life of Plutonium than Uranium 234?

Solve the following story problems involving systems of equations by following these steps:

Step 1: Define variables to be the unknown quantities.

Step 2: Write a system of equations that model's the problem's conditions.

Step 3: Solve the system of equations.

Step 4: Write a conclusion which answers the story problem using complete sentences.

- 8 pts 2. A rectangular lot is being fenced on three sides. The fencing along the lot's length costs \$22 per foot while the fencing along the two side widths costs \$8 per foot. The total fencing comes out to 170ft while the cost of the fencing along the three sides comes to \$2340. What are the lot's dimensions?

- 8 pts 3. You are choosing between memberships between Outdoor Store and Adventure Warehouse. Outdoor Store offers an annual membership fee of \$111 which allows you to pay only 80% of the retail price. Adventure Warehouse offers an annual membership fee of \$75 but you pay only 85% of the retail price. What is the retail price of merchandise which would allow you to end up spending the same total amount (including membership fee) at either store? What would that total amount be?

4. You realize how awesome a trebuchet is and decide to build your own. It's a fantastically huge wonder which you launch multiple pianos with. During the destroying of many a good piano you take measurements and determine the piano's flight path can be modeled by the function

$$f(d) = -0.04d^2 + 1.431d + 32.5,$$

where  $h = f(d)$  is the height of the piano (in meters) at the given horizontal distance  $d$  (in meters) from the trebuchet.

Graph  $h = f(d)$  on your calculator and use it to answer the following questions.

**You need to use complete sentence conclusions to answer each of the following questions. Any rounding necessary should be to the second decimal place.**

- 4 pts a. Use the graph on your graphing calculator to determine the horizontal distance(s) of the piano from the trebuchet when it is at a height of 40 meters.
- 4 pts c. Use the graph on your graphing calculator to determine *the maximum height* the piano reaches **and** *the horizontal distance of the piano from the trebuchet* when it reaches this maximum height.
- 4 pts b. Use the graph on your graphing calculator to determine at what horizontal distance from the trebuchet the piano will hit the ground.
- d. From what height is the piano released?
- e. State the domain and range of  $f$  *in context* of this story problem.