This summer assignment is divided into two parts;

Part 1 Notes, definitions and examples

Part 2 Problems for students to work

PART 1

IB MATH STUDIES/SL

SUMMER WORK

2019-2020

The purpose of the summer work for students selecting the IB Math Studies/Subsidiary Level course is to review material that has previously been covered in math classes and which will be used in some form in the IB math program. While review of some of this material is expected, the knowledge that the class has in advanced will lead to covering more new material or expanding in material previously covered, thus leading to higher IB math scores.

Several topics will be reviewed and examples of problems will be given. You will be given a few problems in each sections to work as review. These problems will be discussed at the beginning of the next school year. Note: The last time that this type of assignment was given and because of the cooperation of the students doing the summer work, we were able to cover two additional topics from previous years which led to an increased numbers of students receiving a high enough score to be eligible for college credit.

Table of Contents:

a. Set Theory

b. Logic

4. Probability

a. Conditional Probability

b. Total Probability

Algebra Topics

a) Evaluating Expressions:

Example: If $a = 11$, $b = 6$, and $c = -3$, find the value of $\frac{3a^2 - 2b + c}{4abc}$

First substitute the values for a, b, and c, then evaluate

$$\frac{3(11)^2 - 2(6) + (-3)}{(4)(11)(6)(-3)} = \frac{3(121) - 12 + (-3)}{-792} = \frac{363 - 12 + (-3)}{-792} = -\frac{348}{792} = -\frac{29}{66}$$

b) Solving Equations:

Solve for x: $4(3x - 7) + 5(11 - 2x) = 6(2x - 1)$

$$12x - 28 + 55 - 10x = 12x - 6$$

$$2x + 27 = 12x - 6$$

$$-10x = -33$$

$$x = \frac{33}{10}$$

c) Remember in functional notation $f(x) = y$. Using this information, evaluate $f(3)$ if $f(x) = 6x^2 - 2x + 1$.

This is <u>easy</u>! $f(3) = 6(3)^2 - 2(3) + 1 = (6)(9) - 6 + 1 = 54 - 6 + 1 = 49$

Now let's try $f(-6) = \frac{4x}{5} - \frac{1}{3}x + (3x^2) =$

$$f(-6) = \frac{4(-6)}{5} - \frac{1}{3}(-6) + 3(-6)^2 =$$

$$f(-6) = \frac{-24}{5} + 2 + 3(36) = -\frac{24}{5} + 2 + 108 =$$

$$f(-6) = 110 - \frac{24}{5} = \frac{550 - 24}{5} = \frac{526}{5}$$

d) $f(x) = 4x + 5$ $\quad$ $g(x) = 2x^2 - 3x + 3$

$f(x) + g(x)$ $\quad$ $(f+g)(x) = (4x + 5) + 2x^2 - 3x + 3 = 2x^2 + x + 8$

$f(x) - g(x)$ $\quad$ $(f-g)(x) = (4x + 5) - (2x^2 - 3x + 3) =$

$$-2x^2 + 7x + 2$$

$f(x) \cdot g(x) = (4x + 5)(2x^2 - 3x + 3) = 8x^3 - 2x^2 - 3x + 15$

$2g(x) - 3f(x) = 2(2x^2 - 3x + 3) - 3(4x + 5) =$

$$4x^2 - 6x + 6 - 12x - 15 = 4x^2 - 18x - 9$$

(d) (continued)

$$\frac{g(x)}{f(x)} = \frac{2x^2-3x+3}{4x+5} \text{ and } x \neq -5/4$$

(Remember, the denominator of a fraction can not $= 0$.)

(e) $f(x) = 4x+5$ $\quad g(x) = 2x^2-3x+3$

Determine $f(g(x))$ and $g(f(x))$

$f(g(x)) \to$ We will take the range of $g(x)$ and substitute it in the domain of $f(x)$.

$f(g(x)) = 4(2x^2-3x+3)+5 = 8x^2-12x+12+5 = 8x^2-12x+17$

$g(f(x)) \to$ We will take the range of $f(x)$ and substitute it in the domain of $g(x)$

$g(f(x)) = 2(4x+5)^2-3(4x+5)+3 = 2(16x^2+40x+25)-(12x+15)+3 =$

$32x^2+80x+50-12x-15+3 = 32x^2+68x+38$

(f) Inverse functions: When finding the equations for inverse functions, interchange the "x" and "y" terms in a given function and solve for y.

Ex: $f(x) = 2x+3$. Find the equation of the inverse of $f(x)$.

$f(x) = y \quad y = 2x+3 \to$ interchange x and y

$x = 2y+3 \to$ Solve for y $\to$ $x-3 = 2y \to$

$\frac{x-3}{2} = y$

$y = 3x^3-7 \to \quad x = 3y^3-7 \to \quad x+7 = 3y^3 \to$

$\frac{x+7}{3} = y^3 \qquad y = \sqrt[3]{\frac{x+7}{3}}$

Quadratic Equations and Functions

A quadratic function is a function defined by the equation $f(x) = ax^2 + bx + c$ where a, b, and c are real numbers and $a \neq 0$. If $f(x) = 0$, the equation $ax^2 + bx + c = 0$ is called a quadratic equation.

Solving Quadratic Equations: There are three methods to solve quadratic equations – (a) factoring and setting factors equal to zero (b) completing the square (c) using the quadratic formula.

We will review methods "a" and "c"

Factoring: (a) Solve $x^2 + 7x + 6 = 0$ → Factor the equation

$(x+6)(x+1) = 0$ → Set factors equal to 0 and

Solve $x + 6 = 0$ or $x + 1 = 0$

$x = -6$ or $x = -1$ Check if these are solutions.

(b) Solve $12x^2 - x - 6 = 0$ → $(4x - 3)(3x + 2) = 0$

$4x - 3 = 0$ or $3x + 2 = 0$

$4x = 3$ → $x = 3/4$ or $3x = -2$ → $x = -2/3$

Quadratic Formula: This method will work for any quadratic equation. (Factoring can often be difficult.)

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Solve: $2x^2 - 3x - 5 = 0$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{9 + 40}}{4} = \frac{3 \pm \sqrt{49}}{4}$$

$$x = \frac{3 \pm 7}{4} \quad x = \frac{-4}{4} = -1 \text{ or } x = \frac{10}{4} = \frac{5}{2}$$

Graphing a quadratic function: $y = ax^2 + bx + c$

The graph of a quadratic function is called a parabola.

To graph a parabola, use the following steps.

(1) Find the equation of the axis of symmetry
$x = -\frac{b}{2a}$

(2) Find the coordinate of the vertex, Substitute the answer from step (1) in the equation to find y. This will give you the coordinate of the vertex.

(3) Find the coordinate of the y-intercept.

(4) Find the coordinates symmetric to the y-intercept

(5) Find the coordinates of two additional points on the parabola. (Find zeroes if possible.)

(6) Plot points and sketch graph

EXAMPLE: 1

GRAPH $y = x^2 - 6x + 5$

ⓐ $x = \frac{-(-6)}{2(1)} = x = 3$ (A Vertical line through $x = 3$)

ⓑ $y = (3)^2 - 6(3) + 5 \quad y = 9 - 18 + 5 = -4 \quad (3, -4)$ vertex

ⓒ y-intercept is c (found when $x = 0$) $\quad (0, 5)$

ⓓ Coordinate of symmetric point to y-intercept $\quad (6, 5)$
This point has the same y value and is the same distance but on the opposite side of the axis of symmetry.

(e) Let $y = 0 \quad x^2 - 6x + 5 = 0 \quad (x - 5)(x - 1) = 0$

$x - 5 = 0 \quad x = 5 \qquad x - 1 = 0 \quad x = 1$

$(5, 0) \quad (1, 0)$ are coordinates on the graph

EXAMPLE #2

GRAPH $y = 4x^2 + 8x + 3$

ⓐ $x = -\frac{b}{2a}$ $\quad x = \frac{-8}{2(4)} = \frac{-8}{8} = -1$

ⓑ $y = 4(-1)^2 + 8(-1) + 3 = 4 - 8 + 3 = -1$ $\quad (-1, -1)$

ⓒ y-intercept $(0, 3)$

(d) Symmetric pt $(-2, 3)$

(e) $4x^2 + 8x + 3 = 0$ $\quad (2x + 1)(2x + 3) = 0$

$2x + 1 = 0$ $\qquad 2x + 3 = 0$

$2x = -1 \quad x = -1/2$ $\qquad 2x = -3 \quad x = -3/2$

$(-1/2, 0)$ $\quad (-3/2, 0)$

EXAMPLE #3

GRAPH $y = -x^2 - 2x + 24$

ⓐ $x = \frac{-b}{2a}$ $\quad x = \frac{2}{2(-1)} = \frac{2}{-2} = -1$ axis of symmetry

ⓑ $y = -(-1)^2 - 2(-1) + 24 = -1 + 2 + 24 = 25$ $\quad (-1, 25)$ Vertex

ⓒ y-intercept $(0, 24)$

ⓓ Symmetric point $(-2, 24)$

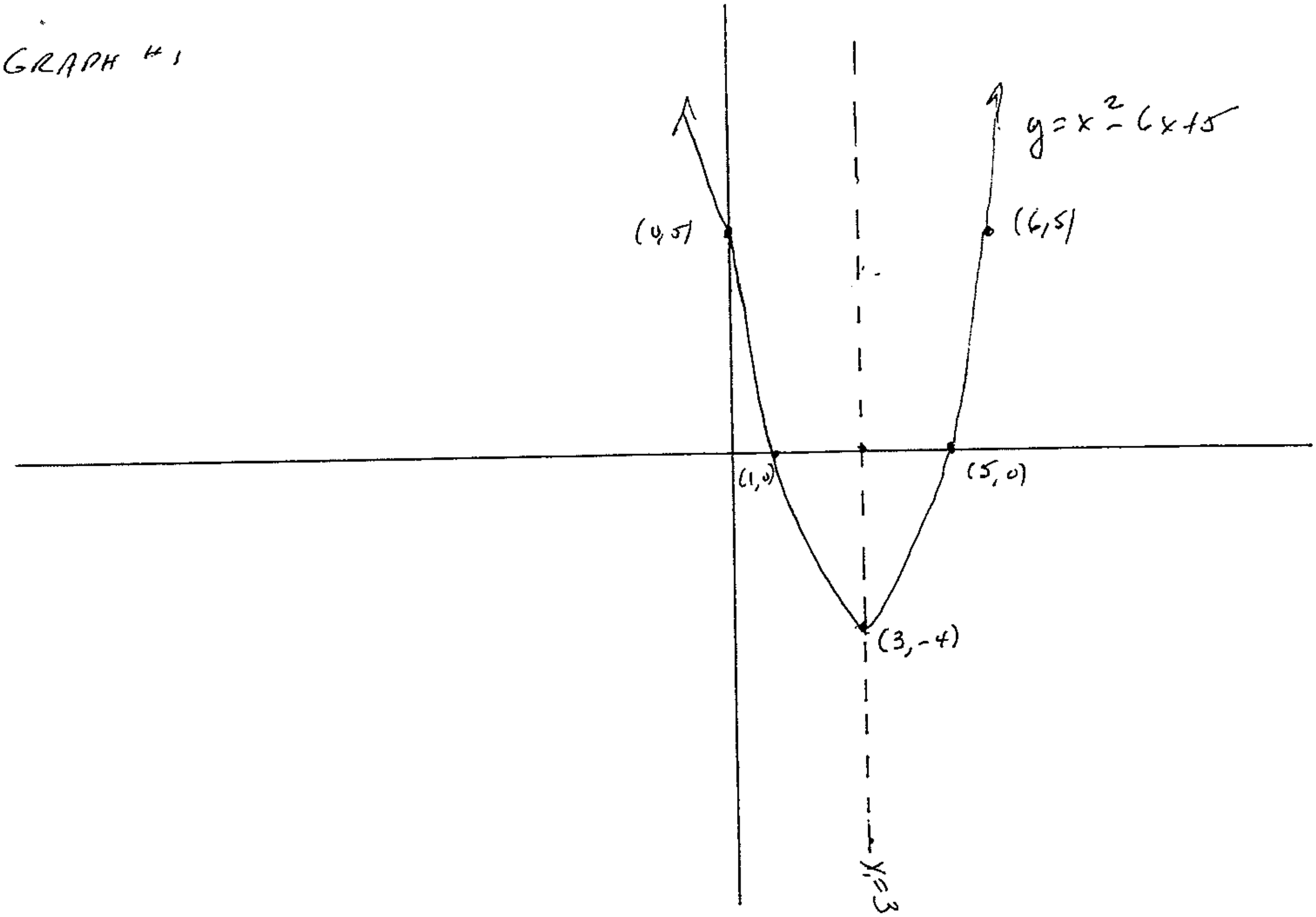
(e) $-x^2 - 2x + 24 = 0$ $\quad 24 - 2x - x^2 = 0$ $\quad (6 + x)(4 - x) = 0$

$6 + x = 0$ or $4 - x = 0$

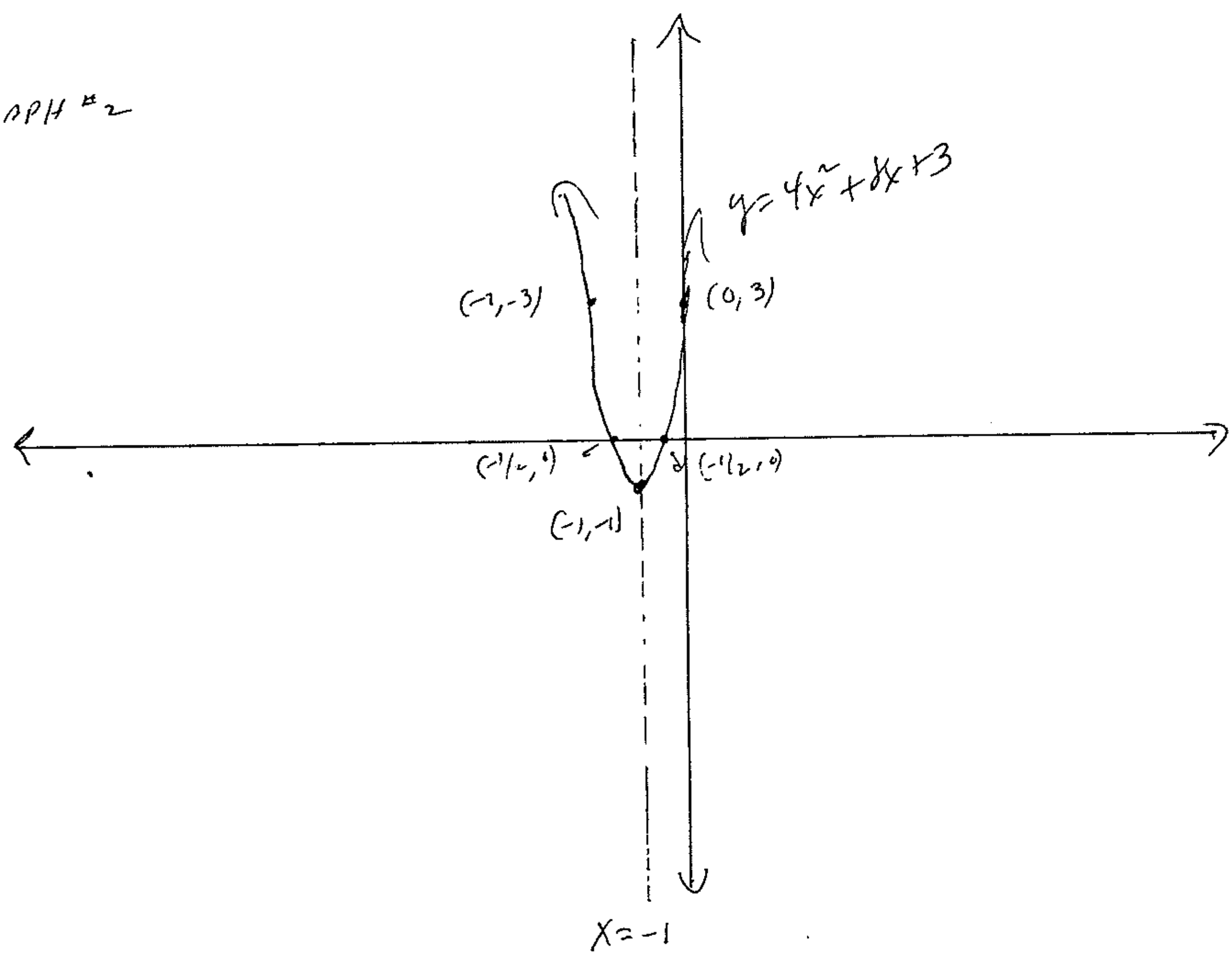
$x = -6$ or $4 = x$

$(-6, 0)$ and $(4, 0)$ zeroes of graph

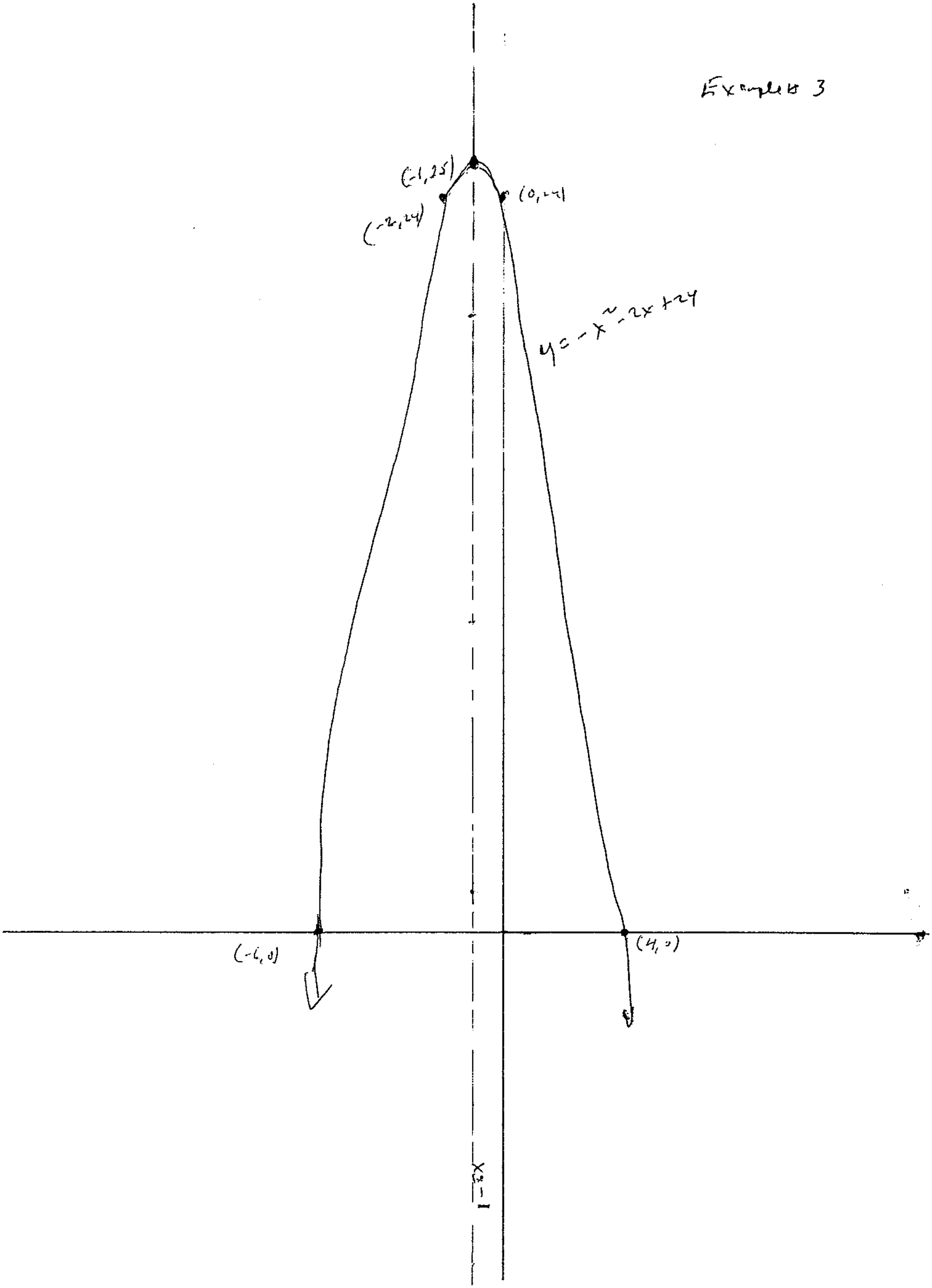
GRAPH #1



GRAPH #2



Example 3



OTHER NOTES ON PARABOLAS: $y = ax^2 + bx + c$

- If $a > 0$, graph opens upward • If $a < 0$, graph opens down.
- If $b^2 - 4ac > 0$, graph intersects x-axis at two points
- If $b^2 - 4ac = 0$, graph touches x-axis at one point (tangent to x-axis)
- If $b^2 - 4ac < 0$, graph does not cross x-axis.

Example: Find an equation of the parabola with x-intercepts 3 and 6 and y-intercept = 2.

x-intercepts 3 and 6 → Factors $(x-3)(x-6)$. Thus $y = a(x-3)(x-6)$.

$x=0$, $y=2$ (y-intercept) $\quad 2 = a(x-3)(x-6) \rightarrow 2 = a(-3)(-6) \rightarrow \cancel{2} = 18a \quad a = 1/9$

EQUATION OF PARABOLA $\quad y = 1/9(x-3)(x-6) \Rightarrow y = 1/9(x^2 - 9x + 18) \Rightarrow \underline{y = \frac{1}{9}x^2 - x + 2}$

SOLVING SYSTEMS OF EQUATIONS (LINEAR)

THERE ARE FOUR MAJOR WAYS OF SOLVING SYSTEMS OF EQUATIONS. THE SOLUTION OF A SYSTEM OF EQUATIONS IS THE COORDINATE OF THE POINT OF INTERSECTION OF THE LINES. THE FOUR METHODS ARE (a) GRAPHING EACH LINEAR FUNCTION TO DETERMINE THE POINT OF INTERSECTION (b) LINEAR COMBINATION (ADDITION-MULTIPLICATION METHOD) (c) SUBSTITUTION METHOD AND (d) USE OF DETERMINANTS. EACH HAS ADVANTAGES AND DISADVANTAGES:

GRAPHING - SOMETIME IS DIFFICULT TO DETERMINE THE POINT OF INTERSECTION IF IT IS A FRACTION.

LINEAR COMBINATION - SOMETIME INVOLVES LARGE NUMBERS

SUBSTITUTION - CAN OFTEN RESULT IN WORKING WITH "NASTY" FRACTIONS

DETERMINANTS - USUALLY IS TOO DIFFICULT IF YOU KNOW HOW TO EVALUATE DETERMINANTS.

I AM GOING TO USE THE LINEAR COMBINATION METHOD FOR OUR EXAMPLES.

EXAMPLE #1 SOLVE THE SYSTEM OF EQUATIONS $\quad 3x + 4y = 13$, $5x - 2y = 13$

$3x + 4y = 13$
$5x - 2y = 13$

$1(3x + 4y = 13) \rightarrow 3x + 4y = 13$
$(5x - 2y = 13)2 \rightarrow 10x - 4y = 26$

$3x + 4y = 13$
$\underline{10x - 4y = 26}$
$13x = 39$
$x = 3$

$3(3) + 4y = 13$
$9 + 4y = 13$
$4y = 4$
$y = 1$

$(3,1)$ - POINT OF

STEP 1 - DETERMINE WHICH VARIABLE WE WANT TO ELIMINATE. IN THIS PROBLEM, WE WILL ELIMINATE THE "Y" TERM BECAUSE THEY HAVE OPPOSITE SIGNS.

STEP 2 - FIND A COMMON MULTIPLE OF THE COEFFIENTS OF "Y". IN THIS PROBLEM IT IS 4.

STEP 3 - MULTIPLY EACH EQUATION BY A NUMBER SO THAT THE COEFFICIENTS OF "Y" HAVE THE SAME NUMERICAL VALUE.

STEP 4 - ADD THE EQUATIONS

STEP 5 - SOLVE FOR THE REMAINING VARIABLE

STEP 6 - SUBSTITUTE IN EITHER ORIGINAL EQUATION TO FIND THE OTHER VARIABLE

Example #2 Solve the system of equations $5x + 6y = -20$
$4x + 5y = -17$

$5x + 6y = -20$
$4x + 5y = -17$

We will eliminate y

$5(5x + 6y = -20) \rightarrow$ $25x + 30y = -100$
$-6(4x + 5y = -17)$ $\quad -24x - 30y = 102$

$X = 2$

$5(2) + 6y = -20$
$10 + 6y = -20$
$6y = -30$
$y = -5$

$(2, -5)$ point of intersection

Example #3 Solve the system of equations $2x + y = 5.$
$3x + 2y = 6.$

We will solve this by substitution.

(1) We will solve the first equation for y.
$y = 5 - 2X$

(2) Substitute the value for "y" in the second equation
$3x + 2(5 - 2x) = 6$

(3) Solve for x: $\quad 3x + 10 - 4x = 6 \rightarrow -x + 10 = 6 \rightarrow -x = -4 \rightarrow x = 4$

(4) Substitute the value for X in equation from (1)
$y = 5 - 2(4) \qquad y = 5 - 8 = -3$

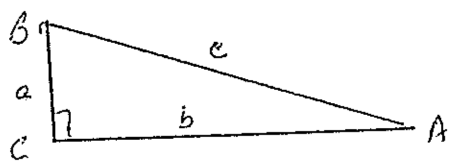
Point of intersection $(4, -3)$

GEOMETRY AND TRIGONOMETRY

HERE ARE SOME GEOMETRY RULES THAT YOU NEED TO REMEMBER

TRIANGLES:

(1) The sum of the measures of the interior angles of a triangle is 180°
(2) The measure of an exterior angle of a triangle equals the sum of the measures of the remote (nonadjacent) interior angles.
(3) The acute angles of a right triangle are complementary.
(4) All angles of an equiangular triangle are congruent.
(5) An isosceles triangle has two congruent sides.
(6) The base angles of an isosceles triangle are congruent.
(7) The sum of the lengths of any two sides of a triangle is greater than the length of the third side.



RIGHT TRIANGLE RULES: (REFER TO FIGURE ABOVE)

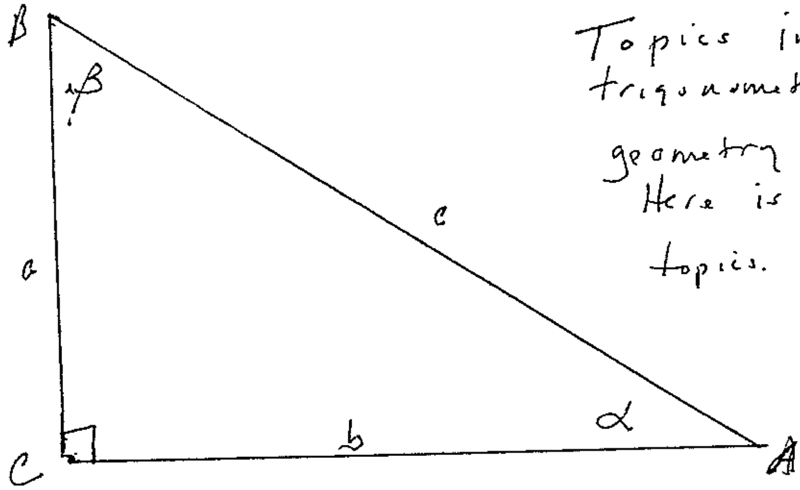
(1) $c^2 = a^2 + b^2$ (Pythagorean Theorem)
(2) In a 30°-60° right triangle, the length of the side opposite the $30^\circ \angle$ (the shorter leg) = $1/2$ the length of the hypotenuse.
(3) In a 30°-60° right triangle, the length of the side opposite the $60^\circ \angle$ (the longer leg) = the length of the shorter leg $\times \sqrt{3}$.
(4) In an isosceles right triangle, either leg has length equal to the length of the hypotenuse $\div \sqrt{2}$. (The length of the hypotenuse equals either leg $\times \sqrt{2}$.)

QUADRILATERALS:

(1) The diagonals of a parallelogram bisect each other.
(2) The diagonals of a rectangle are congruent.
(3) The diagonals of a rhombus are perpendicular.

TRIGONOMETRY NOTES

RIGHT TRIANGLE TRIGONOMETRY



Topics involving right triangle trigonometry were covered briefly in geometry and possibly algebra II. Here is a quick review of these topics.

At the left is right $\triangle ABC$ with $\angle ACB$ ($\angle C$) the right angle.

We will review the three trig. functions used most frequently with right triangles: sine, cosine and tangent. Here are the functions for α and β, the acute angles of the right triangle:

$\sin\alpha = \frac{a}{c}$ $\frac{\text{(opposite leg)}}{\text{(hypotenuse)}}$ $\qquad \sin\beta = \frac{b}{c}$

$\cos\alpha = \frac{b}{c}$ $\frac{\text{(adjacent leg)}}{\text{(hypotenuse)}}$ $\qquad \cos\beta = \frac{a}{c}$

$\tan\alpha = \frac{a}{b}$ $\frac{\text{(opposite leg)}}{\text{(adjacent leg)}}$ $\qquad \tan\beta = \frac{b}{a}$

(Remember, in a right triangle, the functions are for the acute angles only).

Let's examine a few examples.

Example #1 If $\alpha = 50°$ and $c = 19$ cm., find a.

$\sin\alpha = \frac{a}{c} \rightarrow \sin 50° = \frac{a}{19} \rightarrow .7660 = \frac{a}{19} \rightarrow a = (.7660)(19)$

$a = 14.554$ cm.

(Note: We will round trig functions to 4 decimal places)

Example # 2 If $\beta = 29^\circ$ and $a = 30$ cm, find b.

$\tan \beta = \frac{b}{a} \rightarrow \tan 29^\circ = \frac{b}{30} \rightarrow .5543 = \frac{b}{30} \rightarrow b = (30)(.5543) \rightarrow$

$b = 16.629$ cm

Example # 3 If $\beta = 57^\circ$ and $a = 25$ cm, find c

$\cos \beta = \frac{a}{c} \rightarrow \cos 57^\circ = \frac{25}{c} \rightarrow c \cdot \cos 57^\circ = 25 \rightarrow$

$.5446\, c = 25 \rightarrow c = \frac{25}{.5446} \rightarrow c = 45.91$ cm

Example # 4 If $a = 25$ and $b = 60$, find α.

$\tan \alpha = \frac{a}{b} \rightarrow \tan \alpha = \frac{25}{60} \rightarrow \tan \alpha = .4167$

$\alpha = 22.62^\circ$

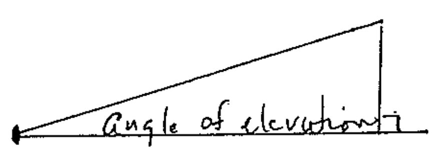
(Use shift key or 2nd function key on calculator)

Example # 5 If $b = 12$ and $c = 11$, find β.

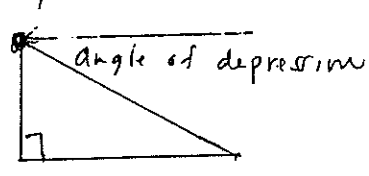
$\sin \beta = \frac{b}{c} \rightarrow \sin \beta = \frac{12}{11} \rightarrow \sin \beta = 1.0909$

$\beta =$ no solution since the sine cannot be > 1.

Angle of elevation: This is the angle formed when a person looks up at an object.



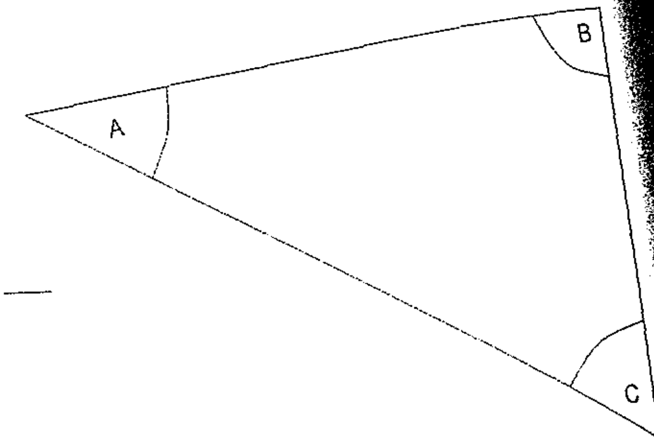
Angle of depression: This is the angle formed when a person looks down at an object.



Note: the angle of depression is formed with the horizontal line from the line of sight and lies outside the triangle.

6.2. – SINE AND COSINE RULE

The sine rule: For any triangle, given the sides a, b and c and their corresponding opposite angles, A, B and C:



$$\frac{Sin(A)}{a} = \frac{Sin(B)}{b} = \frac{Sin(C)}{c}$$

How many equations are written above? ____

I. $\frac{\sin A}{a} = \frac{\sin B}{b}$

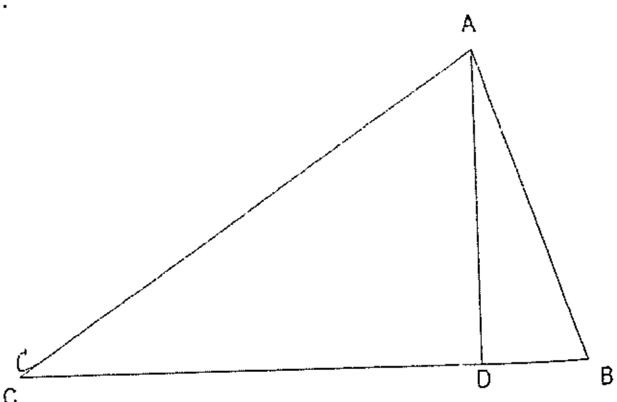
II. $\frac{\sin A}{a} = \frac{\sin C}{c}$

III. $\frac{\sin B}{b} = \frac{\sin C}{c}$

The cosine rule: For any triangle, given the sides a, b and c and their corresponding opposite angles, A, B and C:

$$a^2 = b^2 + c^2 - 2bc\cos(A)$$
$$b^2 = a^2 + c^2 - 2ac\cos(B)$$
$$c^2 = a^2 + b^2 - 2ab\cos(c)$$

Given the following triangle:



a. Find AD in terms of AC and the angle C.

$AD = AC(\sin C)$

b. Find the Area of the triangle in terms of AB, BC and the angle C.

$A_{\Delta ABC} = \frac{1}{2}(BC)(AD)$

$A_{\Delta ABC} = \frac{AC \cdot BC \cdot \sin C}{2}$

c. Conclusion:

The area of a triangle equals one-half the product of any two sides of a triangle and the sine of the angle included between the two sides.

COORDINATE GEOMETRY

COORDINATE GEOMETRY USES THE COORDINATE AXIS SYSTEM TO SOLVE PROBLEMS. WE HAVE PREVIOUSLY USED THE COORDINATE AXIS SYSTEM WHEN GRAPHING QUADRATIC FUNCTIONS. THERE ARE OTHER USES OF THE COORDINATE AXIS SYSTEM.
WE WILL USE THE ACCOMPANYING COORDINATE AXIS SYSTEM WITH LINES l_1 and l_2 TO EXAMINE FORMULAS AND RULES THAT ARE USEFUL IN PROBLEMS INVOLVING GRAPHS.

SLOPE FORMULA: $m = \frac{y_2 - y_1}{x_2 - x_1}$ (slope = $\frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$)

l_1: $m = \frac{7-4}{5-1} = \frac{3}{4}$ $\quad l_2$: $m = \frac{7-(-4)}{-6-2} = \frac{11}{-8}$

DISTANCE FORMULA: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

l_1 $\quad d = \sqrt{(5-1)^2 + (7-4)^2} = \sqrt{(4)^2 + (3)^2} = \sqrt{16+9} = \sqrt{25} = 5$

LENGTH OF $\overline{AB}$ IS 5 UNITS

l_2 $\quad d = \sqrt{(2-(-6))^2 + (-4-7)^2} = \sqrt{(8)^2 + (-11)^2} = \sqrt{64+121} = \sqrt{185}$

LENGTH OF $\overline{CD}$ IS $\sqrt{185}$ UNITS

MIDPOINT FORMULA: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

l_1 $\quad M = \left(\frac{5+1}{2}, \frac{7+4}{2}\right) = \left(\frac{6}{2}, \frac{11}{2}\right) = \left(3, \frac{11}{2}\right)$ MIDPOINT OF $\overline{AB}$

l_2 $\quad M = \left(\frac{-6+2}{2}, \frac{7+(-4)}{2}\right) = \left(\frac{-4}{2}, \frac{3}{2}\right) = \left(-2, \frac{3}{2}\right)$ MIDPOINT OF $\overline{CD}$

PARALLEL LINES HAVE EQUAL SLOPES

PERPENDICULAR LINES HAVE SLOPES THAT ARE NEGATIVE RECIPROCALS.

EQUATIONS OF LINES

GIVEN THE COORDINATES OF ANY TWO POINTS ON A LINE, WE CAN FIND THE EQUATION OF THE LINE.

POINT-SLOPE FORMULA: $m = \frac{y - y_1}{x - x_1}$

l_1 $\quad \frac{3}{4} = \frac{y-4}{x-1}$ $\quad 3(x-1) = 4(y-4) \rightarrow 3x - 3 = 4y - 16 \rightarrow$

$\boxed{3x - 4y = -13}$ Standard form OR

$\boxed{4y = 3x + 13 \rightarrow y = \frac{3}{4}x + \frac{13}{4}}$ POINT-SLOPE FORM

l_2 $\quad -\frac{11}{8} = \frac{y-(-4)}{x-2}$ $\quad 8(y+4) = -11(x-2) \rightarrow 8y + 32 = -11x + 22 \rightarrow$

$\boxed{11x + 8y = -10}$ or

$\boxed{8y = -11x - 10 \Rightarrow y = -\frac{11}{8}x - \frac{5}{4}}$

OTHER EXAMPLES: (DO NOT USE COORDINATE AXIS SYSTEM PROVIDED)

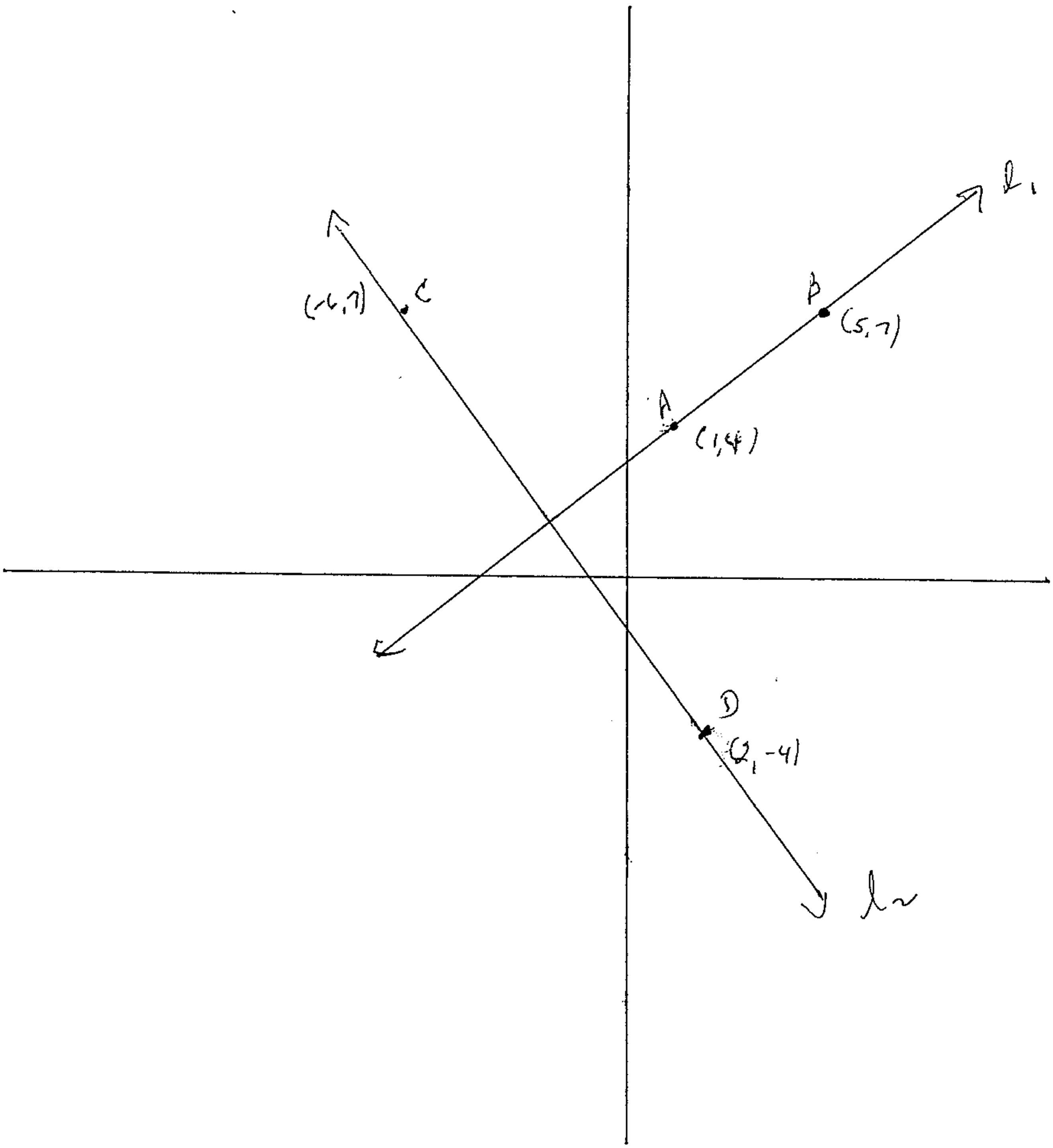
(1) FIND THE EQUATION OF A LINE WITH SLOPE 5/7 AND Y-INTERCEPT 3.

$y = mx + b$ (POINT-SLOPE FORMULA)

$y = \frac{5}{7}x + 3$ (MUST BE GIVEN "Y" INTERCEPT TO USE THIS FORMULA

2) FIND THE SLOPE OF A LINE PERPENDICULAR TO THE LINE IN (1) $\quad m = \frac{5}{7} \longrightarrow m_{\perp} = -7/5$

COORDINATE GEOMETRY



Solid Geometry
Formulas
Surface Areas + Volumes

Solid:

Cuboid (Rect. Solid) $SA = 2lw + 2lh + 2wh$
$V = l \cdot w \cdot h$

Right Circular Cylinder $SA = 2\pi r^2 + 2\pi rh$
$V = \pi r^2 h$

Right Circular Cone $SA = \pi r^2 + \pi rh$ or $\pi(r^2 + rh)$
$V = \frac{1}{3}\pi r^2 h$

Right Prism $SA = 2\,A$ of base $+ L$ (Lateral Area)
$V = A_{\text{of base}} \cdot h$

Sphere $SA = 4\pi r^2$
$V = 4/3\ \pi r^3$

Hemisphere $SA = 2\pi r^2$
$V = \frac{2}{3}\pi r^3$

Right Pyramid $SA = A_{\text{of base}} + L$ (Lateral Area)
$V = \frac{1}{3}(A_{\text{of base}} \cdot h)$

Some Geometry Formulas You Should Know

Triangle $A = \frac{1}{2}bh$ $P = a + b + c$

Rectangle $A = b \cdot h$ $P = 2b + 2h$

Square $A = s^2$ $P = 4s$