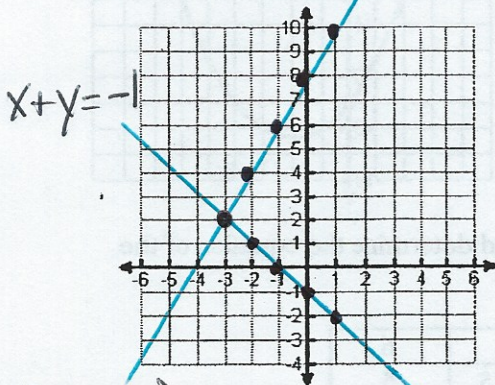


MPM 2DI -- Mid-Term Review

1. Solve by graphing the following systems of equations.

(a) $y = 2x + 8$
 $x + y = -1$

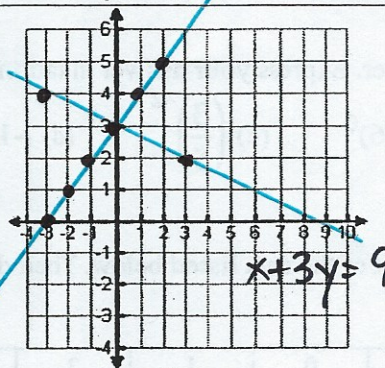


$(-3, 2)$ is solution

$$\begin{array}{r|l} x & y \\ -2 & 4 \\ -1 & 6 \\ 0 & 8 \\ 1 & 10 \end{array}$$

$$\begin{array}{r|l} x & y \\ -2 & -1 \\ -1 & 0 \\ 0 & 1 \\ 1 & 2 \end{array}$$

(b) $y = x + 3$
 $x + 3y = 9$



$(0, 3)$ is solution

$$\begin{array}{r|l} x & y \\ -3 & 0 \\ -2 & 1 \\ -1 & 2 \\ 0 & 3 \\ 1 & 4 \end{array}$$

$$\begin{array}{r|l} x & y \\ -3 & 4 \\ 0 & 3 \\ 3 & 2 \end{array}$$

2. Solve the following using the method of your choice:

(a) $y = 5x - 2$
 $6x + 3y = 36$

(b) $x = -2y + 3$
 $x - 3y = -7$

(c) $2x - 3y = 13$
 $5x - y = 13$

(d) $8x - 3y = 22$
 $6x + 12y = -12$

3. For the situation below,

(i) Define your variables; (ii) write two equations to represent the situation. **DO NOT SOLVE!!!!**

(a) A banquet hall serves chicken dishes that cost \$16 and beef dishes that cost \$18. The 300 wedding guests have ordered their meals in advance, and the total cost is \$5256. How many of each type of meals were prepared?

(b) The school bookstore ordered a total of 130 math and history books. A math book costs \$19.00 and a history book costs \$16.20. If the total bill was \$2274.00, how many math books were bought?

(c) The student council made \$750 from a dance. They put part of the \$750 in a savings account that earns 4% interest and the rest in a chequing account that pays 2%. If the total interest for a year was \$27, how much was put in each account?

4. Given the points $A(x_1, y_1)$ and $B(x_2, y_2)$, state the formulas for:

(a) slope between A and B; (b) midpoint of AB; (c) distance between A and B

5. For each pair of points, determine: (i) slope; (ii) midpoint and (iii) distance between the points

(a) $(3, 5)$ and $(5, 9)$ (b) $(2, -5)$ and $(7, 8)$

6. For each circle:

(i) determine the value of the radius; (ii) sketch the circle; (c) state the x- and y-intercepts

(a) $x^2 + y^2 = 9$

(b) $x^2 + y^2 = 121$

7. For each quadratic relation determine:

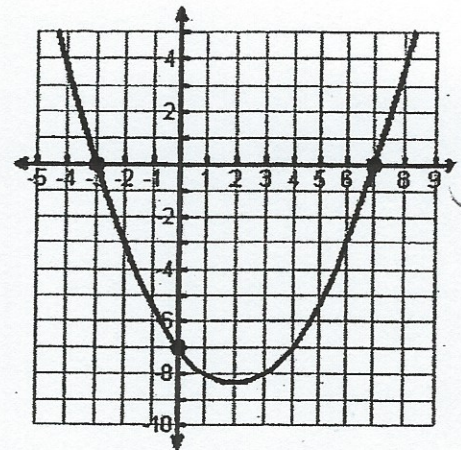
(i) the y-intercept, (ii) the zero's, (iii) the equation of the axis of symmetry, (iv) the vertex, (v) sketch

(a) $y = (x - 4)(x - 10)$

(b) $y = -3(x + 1)(x - 5)$

(c) $y = 2x(x + 4)$

8. Determine the equation of the parabola at the right.
Your equation should be in the form $y = a(x-r)(x-s)$.



9. Expand and simplify:

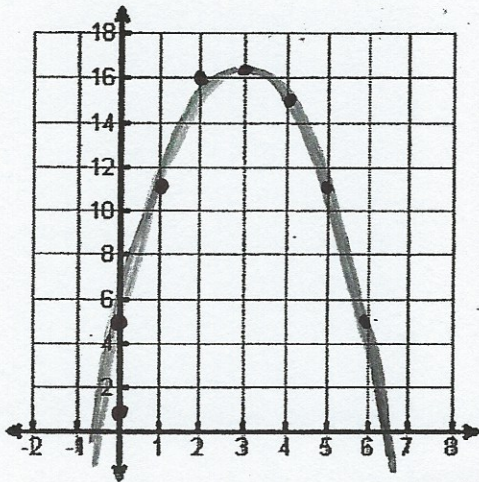
(a) $(x-2)(x+5)$ (b) $(2x-3)^2$ (c) $(3x+2)(4x-1)$

10. Evaluate each power. Express your answer in rational form:

(a) 3^{-4} (b) $(-6)^0$ (c) $\left(\frac{3}{5}\right)^{-2}$ (d) -11^0 (e) $(-5)^2$

11. Create a scatter plot of the data listed below. Then draw a curve of best fit and determine the equation of the curve of best fit.

x	0	1	2	3	4	5	6
y	5	11.25	15	16.25	15	11.25	5



Zeros $(-0.5, 6.5)$
 Axis of Symmetry $x=3$
 Vertex $(3, 16.25)$
 $y = a(x+0.5)(x-6.5)$
 $16.25 = a(3+0.5)(3-6.5)$
 $16.25 = a(-12.25) \Rightarrow a = \frac{16.25}{-12.25}$
 $= -1.33$
 ~~$y = -1.33(x+0.5)(x-6.5)$~~

You may use the XYPOINTS program in the TI-84+ to complete the last two questions.

12. Classify the triangle formed by the points: A(1, 1); B(-2, -1) and C(3, -2)

13. Given a quadrilateral with vertices at K(-3, 4); L(1, 2); M(3, -4) and N(-5, -2), prove that the midsegments of the quadrilateral form a parallelogram.

Mid-Term Review Answers

- (a) (-3, 2) (b) (0, 3) 2. (a) (2, 8) (b) (-1, 2) (c) (2, -3) (d) (2, -2)
- (a) $x = \#$ of chicken dishes, $y = \#$ of beef dishes; $x + y = 300$; $16x + 18y = 5256$
- (b) $x = \#$ of math books, $y = \#$ of history books; $x + y = 30$; $19x + 16.20y = 2274$
- (c) $x =$ amount in the savings account, $y =$ amount in the chequing account; $x + y = \$750$; $0.04x + 0.02y = 7$
- (a) $m = \frac{y_2 - y_1}{x_2 - x_1}$ (b) $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ (c) $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- (a) $m = 2$; $M = (4, 7)$; $d = 4.47$; (b) $m = 13/5$, $M = (4.5, 1, 5)$; $d = 13.9$
- (a) (i) $r = 3$; (iii) (3, 0) and (-3, 0); (0, 3) and (0, -3) (b) (i) $r = 11$; (iii) (11, 0) and (-11, 0); (0, 11) and (0, -11)
- (a) (i) (0, 40); (ii) $x = 4, x = 10$; (iii) $x = 7$; (iv) (7, -9) (b) (i) (0, 15); (ii) $x = -1, x = 5$; (iii) $x = 2$; (iv) (2, 27)
- (i) (0, 0); (ii) $x = 0, x = -4$; (iii) $x = -2$; (iv) -8
- $y = \frac{1}{3}(x+3)(x-7)$ 9. (a) $x^2 + 3x - 10$ (b) $4x^2 - 12x + 9$ (c) $12x^2 + 5x - 2$
- (a) $\frac{1}{81}$ (b) 1 (c) $\frac{25}{9}$ (d) -1 (e) 25 11. The value of "a" will depend on where you picked your zero's. The zero's should be somewhere around 6.5 and 0.5 and the "a" value is around -1.3

2. a) Substitution

Sub $y = 5x - 2$ into $6x + 3y = 36$

$$6x + 3(5x - 2) = 36$$

$$6x + 15x - 6 = 36$$

$$21x = 36 + 6$$

$$\frac{21x}{21} = \frac{42}{21}$$

$$x = 2$$

Sub $x = 2$
into one
equation.

$$y = 5(2) - 2$$
$$= 10 - 2$$
$$= 8$$

b) Substitution $\therefore (2, 8)$

Sub $x = -2y + 3$ into $x - 3y = -7$

$$(-2y + 3) - 3y = -7$$

$$-2y + 3 - 3y = -7$$

$$-2y - 3y = -7 - 3$$

$$\frac{-5y}{-5} = \frac{-10}{-5}$$

$$y = 2$$

Sub $y = 2$
into an
equation

$$x = -2(2) + 3$$
$$= -4 + 3$$
$$= -1$$

$\therefore (-1, 2)$

c) Elimination

$$(1) 2x - 3y = 13$$

$$(2) 5x - y = 13 \quad (\times 3)$$

$$(2) \rightarrow 15x - 3y = 39$$

$$(1) \quad 2x - 3y = 13$$

Subtract

$$13x = 26$$

$$x = 2$$

Sub $x = 2$ into Equation (2)

(2)

$$5(2) - y = 13$$

$$10 - y = 13$$

$$10 - 13 = y$$

$$y = -3$$

∴ solution is $(2, -3)$

2d) (1) $8x - 3y = 22 \quad \times 4$

(2) $6x + 12y = -12$

(1) $32x - 12y = 88$

(2) $6x + 12y = -12$

} Add

$$\frac{38x}{38} = \frac{76}{38}$$

$$x = 2$$

Sub $x = 2$ into Equation (1)

$$8(2) - 3y = 22$$

$$16 - 3y = 22$$

$$-3y = 22 - 16$$

$$\frac{-3y}{-3} = \frac{6}{-3}$$

$$y = -2$$

∴ solution is $(2, -2)$

3. a) Let x represent ^{no. of} chicken dishes
Let y represent _{no. of} beef dishes

3

① $x + y = 300$

② $16x + 18y = 5256$

b) Let x represent the no. of math books
Let y represent the no. of history books

① $x + y = 130$

② $19x + 16.20y = 2274.00$

c) Let x represent the amount in savings
Let y represent the amount in chequing

① $x + y = 750$

② $0.04x + 0.02y = 27$

4. a) $m = \frac{y_2 - y_1}{x_2 - x_1}$

b) Midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

c) $D_{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

5. a) i) Slope $m = \frac{9-5}{5-3}$
 $= \frac{4}{2} = 2$

5a ii) Midpoint = $\left(\frac{3+5}{2}, \frac{5+9}{2}\right)$
 $= \left(\frac{8}{2}, \frac{14}{2}\right)$
 $= (4, 7)$

(4)

iii) distance = $\sqrt{(9-5)^2 + (5-3)^2}$
 $= \sqrt{4^2 + 2^2}$
 $= \sqrt{16+4}$
 $= \sqrt{20} = 4,47$

b) i) slope = $\frac{8-(-5)}{7-2} = \frac{8+5}{5} = \frac{13}{5}$

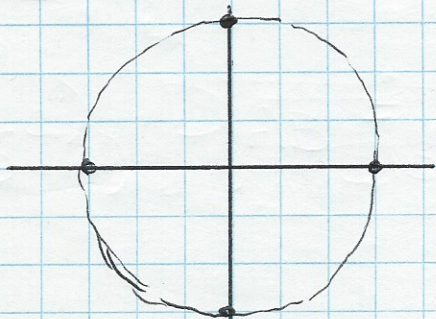
ii) Midpoint = $\left(\frac{2+7}{2}, \frac{-5+8}{2}\right) = \left(\frac{9}{2}, \frac{3}{2}\right) = (4,5, 1,5)$

iii) $D = \sqrt{(8-(-5))^2 + (7-2)^2}$
 $= \sqrt{(8+5)^2 + (5)^2}$
 $= \sqrt{13^2 + 25}$
 $= \sqrt{169+25} = \sqrt{194} = 13,9$

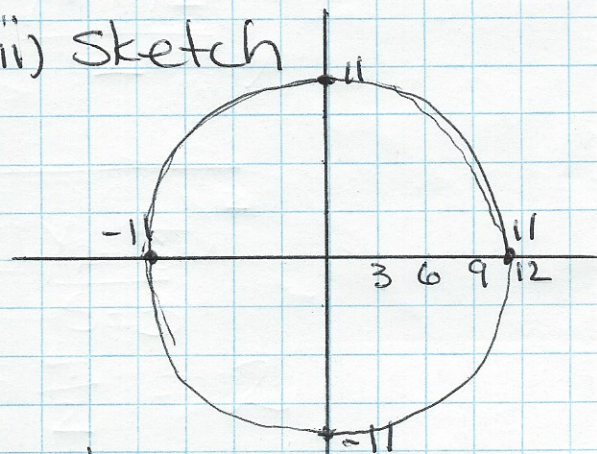
6. a) i) radius = $\sqrt{9} = 3$

b) i) $r = \sqrt{121} = 11$

ii) sketch



ii) sketch



iii) x-intercepts = 3, -3
y-intercepts = 3, -3

iii) x-intercepts = 11, -11
y-intercepts = 11, -11

7. a) i) y-intercept
when $x=0$
 $y=(0-4)(0-10)$
 $y=40$

ii) zeroes = 4, 10

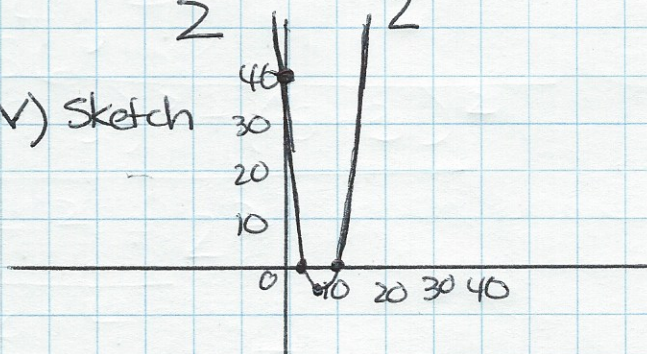
(5)

iii) axis of symmetry

$$x = \frac{4+10}{2} = \frac{14}{2} = 7$$

iv) Vertex
when $x=7$
 $y=(7-4)(7-10)$
 $y=(3)(-3)$
 $y=-9$
 $(7, -9)$

v) sketch



b) i) y-intercept
 $x=0$
 $y=-3(0+1)(0-5)$
 $y=-3(1)(-5)$
 $y=15$

ii) zeroes
= -1, 5

iii) axis of symmetry

$$x = \frac{-1+5}{2} = \frac{4}{2} = 2$$

iv) vertex @ $x=2$

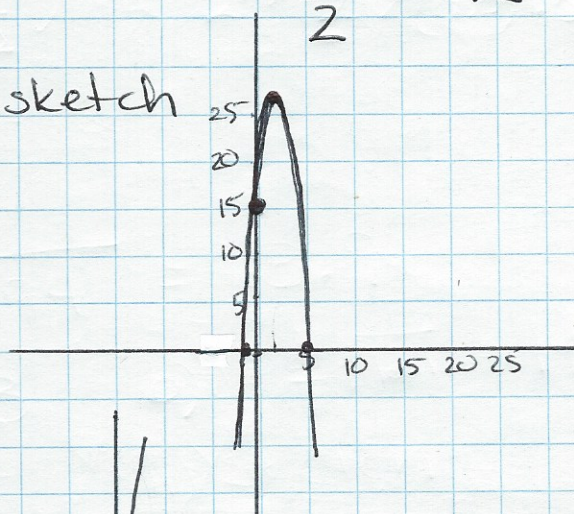
$$y = -3(2+1)(2-5)$$

$$= -3(3)(-3)$$

$$= 27$$

$(2, 27)$

v) sketch



c) i) y-intercept ($x=0$)
 $y=2(0)(0+4)$
 $y=0(4)$
 $y=0$

ii) zeroes = 0, 4

iii) axis of symmetry
 $x = \frac{0+4}{2} = \frac{4}{2} = 2$

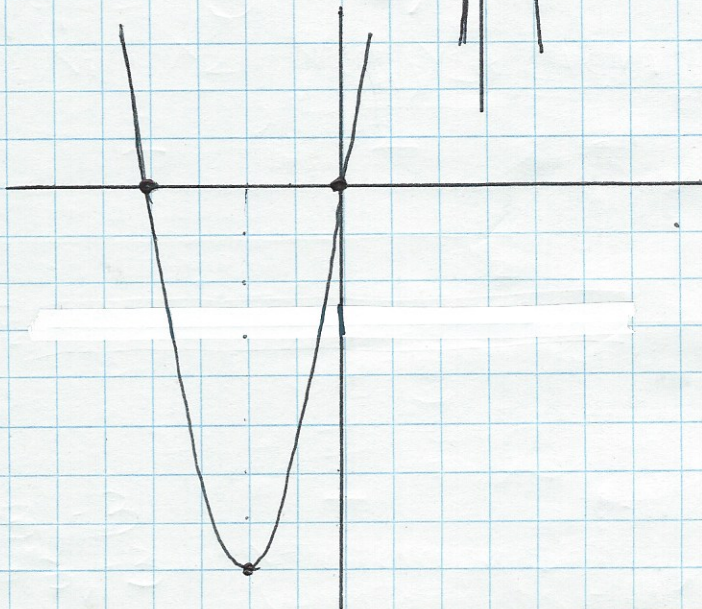
iv) vertex @ $x=-2$

$$y = 2(-2)(-2+4)$$

$$= (-4)(2)$$

$$= -8$$

$(-2, -8)$



8. zeroes = -3, 7 $\therefore y = a(x+3)(x-7)$ (6)

y-int = (0, -7) $\Rightarrow -7 = a(0+3)(0-7)$

$-7 = a(3)(-7)$

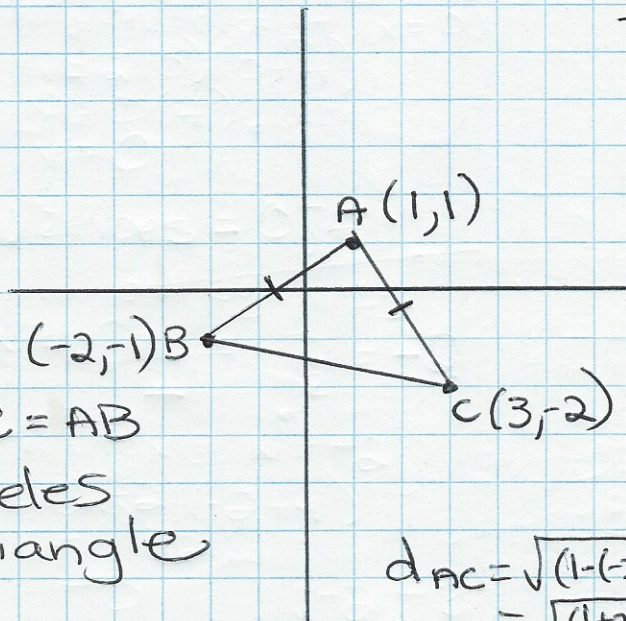
$\frac{-7}{-21} = \frac{a(-21)}{-21} \Rightarrow a = \frac{1}{3}$

$\therefore y = \frac{1}{3}(x+3)(x-7)$

9. a) $(x-2)(x+5)$ b) $(2x-3)^2$ c) $(3x+2)(4x-1)$
 $= x^2 + 5x - 2x - 10 = (2x-3)(2x-3) = 12x^2 - 3x + 8x - 2$
 $= x^2 + 3x - 10 = 4x^2 - 6x - 6x + 9 = 12x^2 + 5x - 2$
 $= 4x^2 - 12x + 9$

10. a) $3^{-4} = \frac{1}{3^4} = \frac{1}{3 \times 3 \times 3 \times 3} = \frac{1}{81}$ b) $(-6)^0 = 1$ c) $(\frac{3}{5})^{-2} = (\frac{5}{3})^2 = \frac{5^2}{3^2} = \frac{25}{9}$ e) $(-5)^2 = -5 \times -5 = 25$
 d) $-11^0 = -1$

12.



Since $AC = AB$
 Isosceles
 Triangle

To classify triangle, find lengths of sides.

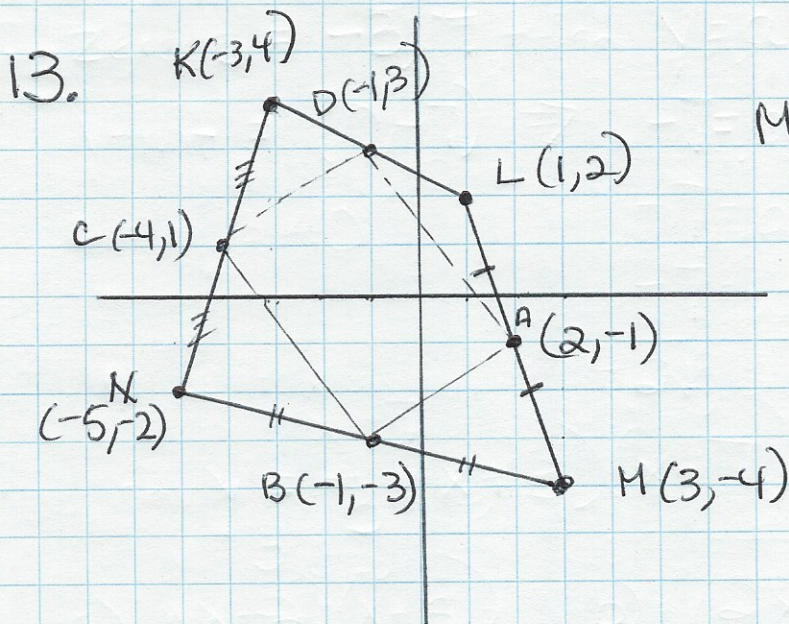
$d_{AB} = \sqrt{(1-(-1))^2 + (1-(-2))^2}$
 $= \sqrt{2^2 + 3^2}$

$= \sqrt{4+9} = \sqrt{13} = 3.6$

$d_{BC} = \sqrt{(-1-(-2))^2 + (-2-3)^2}$
 $= \sqrt{(1)^2 + (-5)^2}$

$= \sqrt{1+25} = \sqrt{26} = 5.1$

$d_{AC} = \sqrt{(1-(-2))^2 + (1-3)^2}$
 $= \sqrt{(1+2)^2 + (-2)^2} = \sqrt{3^2 + 4} = \sqrt{9+4} = \sqrt{13} = 3.6$



Find midpoints

(7)

$$\begin{aligned} \text{Midpt}_{LM} &= \left(\frac{1+3}{2}, \frac{2+(-4)}{2} \right) \\ (A) &= \left(\frac{4}{2}, \frac{-2}{2} \right) \\ &= (2, -1) \end{aligned}$$

$$\begin{aligned} \text{Midpt}_{NM} &= \left(\frac{-5+3}{2}, \frac{-2+(-4)}{2} \right) \\ (B) &= \left(\frac{-2}{2}, \frac{-6}{2} \right) \\ &= (-1, -3) \end{aligned}$$

Find slopes of Midsegments

$$\begin{aligned} \text{Midpt}_{KN} &= \left(\frac{-5+(-3)}{2}, \frac{-2+4}{2} \right) \\ (C) &= (-4, 1) \end{aligned}$$

$$\begin{aligned} \text{Midpt}_{KL} &= \left(\frac{-3+1}{2}, \frac{4+2}{2} \right) \\ (D) &= (-1, 3) \end{aligned}$$

$$\begin{aligned} m_{AB} &= \frac{-1-(-3)}{2-(-1)} = \frac{-1+3}{2+1} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} m_{BC} &= \frac{-3-1}{-1-(-4)} \\ &= \frac{-4}{-1+4} \\ &= \frac{-4}{3} \end{aligned}$$

$$\begin{aligned} m_{CD} &= \frac{3-1}{-1-(-4)} \\ &= \frac{2}{-1+4} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} m_{DA} &= \frac{3-(-1)}{-1-2} \\ &= \frac{3+1}{-3} \\ &= -\frac{4}{3} \end{aligned}$$

Since two sides have the same slopes, the sides are parallel

∴ parallelogram