**Topic test 7**

# Coordinate geometry

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 16 free-response questions (60 marks)

Name: _____

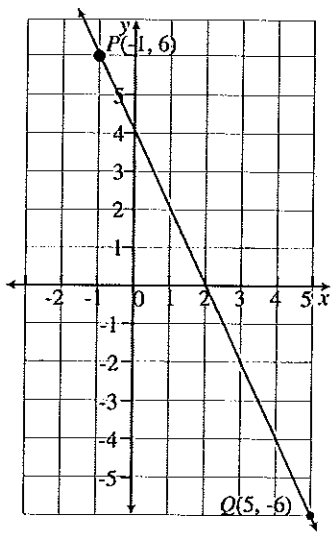
## Part A

**20 multiple-choice questions**
**2 marks each: 40 marks**
**Circle the correct answer.**

**1** Which one of these points lies on the line $y = 3x - 4$?

A (5, 4) B (-1, 12)
C (2, 2) D (4, 3)

Questions **2** to **5** refer to the graph below.




**2** The length of interval $PQ$ is closest to:

A 10.4 units B 13.4 units
C 6.0 units D 12.6 units

**3** The gradient of interval $PQ$ is:

A $\frac{1}{2}$ B $-\frac{1}{2}$
C 2 D -2

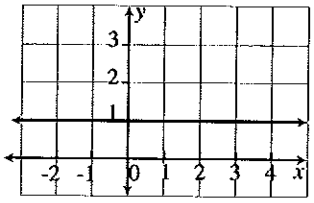
**4** The midpoint of interval $PQ$ is

A (2, 6) B (3, -2)
C (2, 0) D (3, 0)

**5** The line through $PQ$ has equation:

A $y = 2x + 2$ B $y = -2x + 4$
C $y = -\frac{1}{2}x + 2$ D $y = \frac{1}{2}x + 4$

**6** What is the equation of this line?




A $y = x + 1$ B $x = 0$
C $x = 1$ D $y = 1$

**7** The gradient of $y = -3x - 6$ is:

A -6 B -3
C 2 D 3

**8** The $y$-intercept of $y = -3x - 6$ is:

A -6 B -3
C 2 D 3

**9** The $x$-coordinate of the midpoint of the interval joining points $(x_1, y_1)$ and $(x_2, y_2)$ is:

A $\frac{x_1 + y_1}{2}$ B $\frac{x_1 + x_2}{2}$
C $\frac{x_2 - x_1}{2}$ D $\frac{y_2 - y_1}{x_2 - x_1}$

**10** The gradient of $y = \frac{3x}{4} + \frac{1}{2}$ is:

A $-\frac{1}{2}$ B $\frac{1}{2}$
C $-\frac{3}{4}$ D $\frac{3}{4}$

**11** The graph of $x = 0$:

A has zero gradient B is the $x$-axis
C is the $y$-axis D has no $y$-intercept

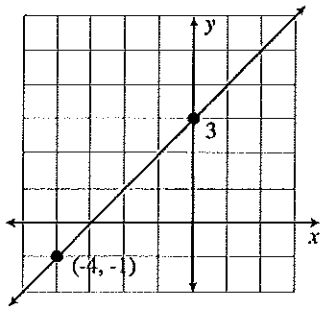
**12** The gradient of $y = \frac{x}{2} + 5$ is:

A $\frac{1}{2}$ B 2
C 5 D 10

**13** Which one of these lines has a gradient of -1?

A $y = -1$ B $y = x - 1$
C $y = -x + 1$ D $y = x + 1$

**14** What is the equation of this line?




**A** $y = x - 4$ **B** $y = x + 3$
**C** $y = -x + 3$ **D** $y = 2x + 7$

**15** Which line is parallel to $y = 2 + 3x$?

**A** $y = 1 - 3x$ **B** $y = \frac{x}{3} + 2$
**C** $y = 3$ **D** $y = 3x + 6$

**16** Which line is parallel to $y = 4$?

**A** $y = 4x$ **B** $y = -1$
**C** $x = 4$ **D** $y = x - 4$

**17** Which one of these points lies on the line $2x + 3y = 9$?

**A** (2, 2) **B** (6, -1)
**C** (-2, 4) **D** (0, -4)

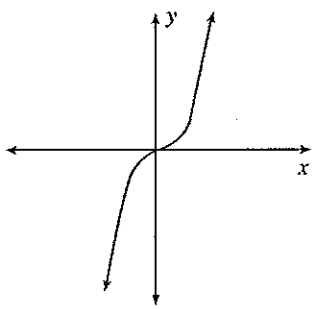
**18** $3x + 4y + 12 = 0$ can be rewritten as:

**A** $y = \frac{3}{4}x + 4$ **B** $y = -\frac{3}{4}x + 3$
**C** $y = \frac{3}{4}x - 4$ **D** $y = -\frac{3}{4}x - 3$

**19** Which one of these lines is not parallel to the other three?

**A** $y = 4 - x$ **B** $y = 6 - 4x$
**C** $-4x = y$ **D** $y = -4x + 10$

**20** What is the equation of this curve?




**A** $x + y = 1$ **B** $y = x^2$
**C** $y = 2^x$ **D** $y = x^3$

## Part B

**16 free-response questions**
**60 marks**
**Show working where appropriate.**

**21** (2 marks) Write the equation of a straight line that has a $y$-intercept of 4.

**22** (2 marks) Draw the graph of $x = -3$ on a number plane.

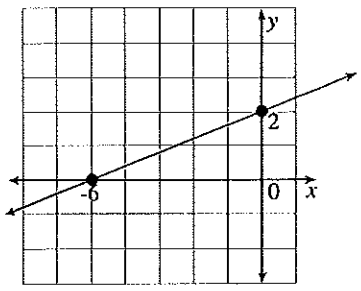
**23** (6 marks) The interval $AB$ on a number plane has endpoints $A(-3, 1)$ and $B(7, 5)$.
Find:

**a** the gradient of $AB$

**b** the length of $AB$ as a surd

**c** the midpoint of $AB$

**24** (2 marks) Find the equation of this line.



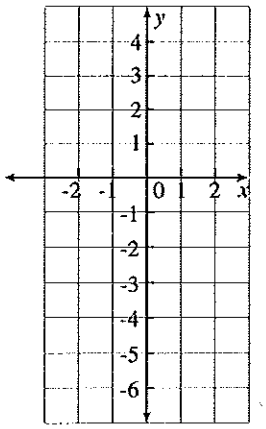
## Topic test 7: Coordinate geometry *continued*

**25** (6 marks) A triangle has vertices at $P(-2, -5)$, $Q(1, 4)$ and $R(10, 1)$. Prove that it is isosceles.

**26** (4 marks)

**a** Graph this table of values on the number plane below.

| $x$ | -1 | 0 | 1 | 2 |
|---|---|---|---|---|
| $y$ | -6 | -3 | 0 | 3 |

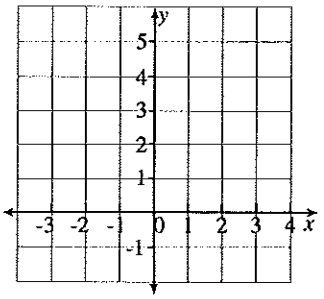



**b** Find the equation of the line.

**27** (2 marks) Write the equation of a line that has a gradient of 7 and a $y$-intercept of -3.

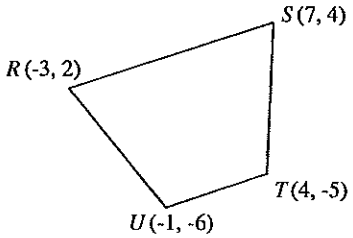
**28** (4 marks)

**a** Graph $y = 2 - \frac{1}{2}x$ on the number plane below.




**b** What is the $x$-intercept of the line?

**29** (4 marks) The vertices of a quadrilateral are $R(-3, 2)$, $S(7, 4)$, $T(4, -1)$ and $U(-1, -6)$. Prove that $RSTU$ is a trapezium.




**30** (2 marks) Rewrite the equation $5x + 2y + 14 = 0$ in gradient–intercept form ($y = mx + b$).

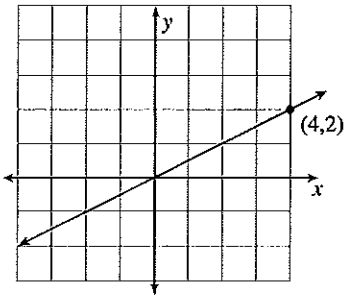
**31** (4 marks) Rewrite each equation in general form ($ax + by + c = 0$).

**a** $y = -3x + 10$

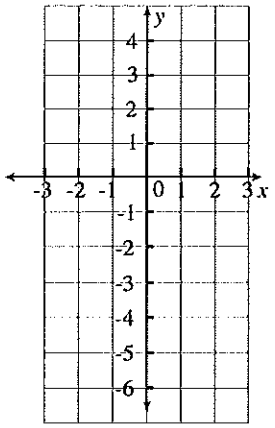
**b** $y = \frac{2x}{5} - 1$

## Topic test 7: Coordinate geometry *continued*

**32** (2 marks) Find the equation of this line.




**33** (6 marks) Graph $y = -2x + 1$ and $y = 3x - 4$ on the number plane below and write the coordinates of the point of intersection.




**34** (6 marks) The vertices of a quadrilateral are $H(0, 6)$, $I(5, 8)$, $J(9, -2)$ and $K(4, -4)$.

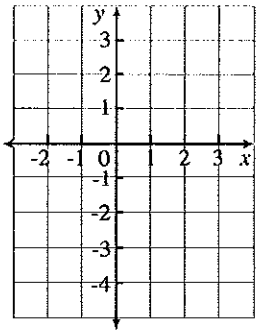
**a** Find the lengths of diagonals $HJ$ and $IK$. (Is the point of intersection of the diagonals also the midpoint of each diagonal?)

**b** Hence what type of quadrilateral is $HIJK$? Give a reason for your answer.

**35** (4 marks) Find the gradient and $y$-intercept of the line with equation $6x - 4y + 6 = 0$.

**36** (4 marks) Complete the table for $y = x^2 - 4$ and graph the equation on the number plane.

| $x$ | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | | | | | | |




**END OF TEST.**

**Use this column for extra working space.**

## Topic test 7 : Coordinate geometry *continued*

**24** (6 marks) Show that the points $S(-6, 2)$, $T(-2, 9)$, $W(4, 6)$ and $X(0, -1)$ are the vertices of a parallelogram.

$m_{ST} = \frac{2-9}{-6--2} = 1.75$

$m_{TW} = \frac{6-9}{4-2} = -0.5$

$m_{WX} = \frac{-1-6}{0-4} = 1.75$

$m_{XS} = \frac{-1-2}{0--6} = -0.5$

2 pairs opposite sides parallel ∴ it's a parallelogram.

**25** (6 marks) Find the $x$- and $y$-intercepts of the line $x + 2y - 4 = 0$ and hence graph the line on the number plane.

$2y = -x + 4$

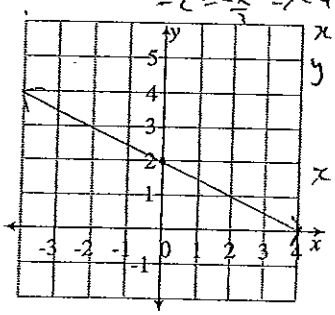
$y = \frac{-x}{2} + 2$

$0 = \frac{-x}{2} + 2$

$-2 = \frac{-x}{2} \rightarrow -4 = -x$

x intercept is 4

y intercept is 2




$x + 2y - 4 = 0$

**26** (9 marks) The points $R(-1, 0)$, $S(9, 5)$ and $T(14, -5)$ are the vertices of a triangle.

**a** Prove that $\triangle RST$ is right-angled at $S$.

$RT = \sqrt{(-1-14)^2 + (0--5)^2} = \sqrt{250}$

$RS = \sqrt{(-1-9)^2 + (0-5)^2} = \sqrt{125}$

$ST = \sqrt{(9-14)^2 + (5--5)^2} = \sqrt{125}$

$RT^2 = RS^2 + ST^2$

$\sqrt{250}^2 = \sqrt{125}^2 + \sqrt{125}^2$

∴ $\triangle RST$ is right $\angle$ at $S$.

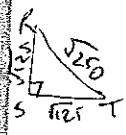
**b** Prove that $\triangle RST$ is isosceles.

$RS = \sqrt{125}$

$ST = \sqrt{125}$ (as shown above)

2 sides equal ∴ $\triangle RST$ is isosceles

**c** Find the area of $\triangle RST$.




$\text{area} = \frac{\sqrt{125} \times \sqrt{125}}{2}$

$= 62.5 \text{ units}^2$

**27** (4 marks) Find in general form the equation of the line that passes through the points (-5, 7) and (3, 0).

$m = \frac{0-7}{3--5} = \frac{-7}{8}$

$y = \frac{-7}{8}x + b$

$0 = \frac{(-7 \times 3)}{8} + b$

$b = 2\frac{5}{8}$ or $\frac{21}{8}$

$y = \frac{-7x}{8} + \frac{21}{8} \rightarrow 8y = -7x + 21$

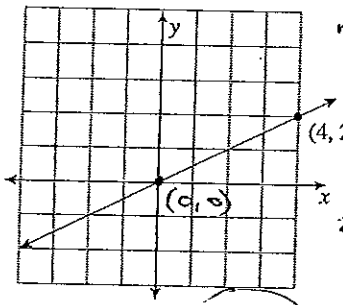
$7x + 8y - 21 = 0$

**28** (2 marks) Write the equation $5x + 2y + 14 = 0$ in gradient-intercept form $y = mx + b$.

$2y = -5x - 14$

$y = \frac{-5x}{2} - 7$

**29** (2 marks) Find the equation of this line.




$m = \frac{2-0}{4-0} = \frac{1}{2}$

$y = \frac{x}{2} + b$

$2 = \frac{4}{2} + b$

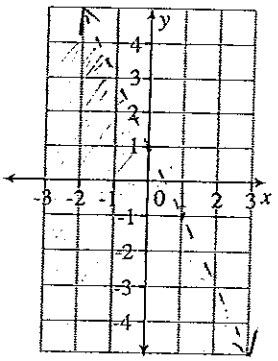
$b = 0$

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

**30** (6 marks) Graph $2x + y < 1$ on the number plane below.

$y < -2x + 1$

$0 < (-2 \times 0) + 1$



## Topic test 7 : Coordinate geometry *continued*

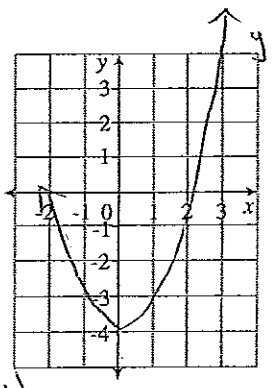
31 (2 marks) Write $y = \frac{2x}{5} - 1$ in general form.

$5y = 2x - 5$

$2x - 5y - 5 = 0$ ✓

34 (4 marks) Complete the table for $y = x^2 - 4$ and graph the equation on the number plane.

| $x$ | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | 0 | -3 | -4 | -3 | 0 | 5 |




32 (6 marks)

a Find the gradient and $y$-intercept of the line with equation $6x - 4y - 4 = 0$.

$4y = 6x - 4$

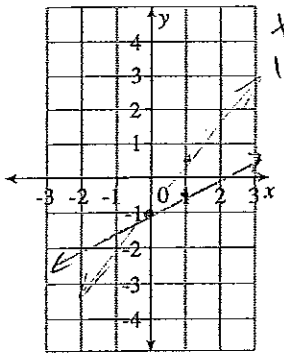
$y = \frac{6x}{4} - 1$

$m = 1.5$ and $b = -1$ ✓

b Hence, graph $6x - 4y - 4 = 0$ on the number plane.

$4y = 6x - 4$

$y = \frac{6}{4}x - 1$




the gradient's 1.5, not 0.5, you idiot! ✓

X

17

33 (6 marks) The vertices of a quadrilateral are $H(0, 6)$, $I(5, 8)$, $J(9, -2)$ and $K(4, -4)$.

a Find the lengths of diagonals $HJ$ and $IK$.

$HJ = \sqrt{(0-9)^2 + (6--2)^2}$

$= \sqrt{145}$ units

$IK = \sqrt{(5-4)^2 + (8--4)^2}$

$= \sqrt{145}$ units ✓

b By finding the midpoints of the diagonals, show that the diagonals bisect each other.

mid $HJ = \frac{0+9}{2}, \frac{6+-2}{2}$

$= (4.5, 2)$

mid $IK = \frac{5+4}{2}, \frac{8+-4}{2}$

$= (4.5, 2)$ ⇒ same midpoint ∴ they bisect each other. ✓

c Hence, what type of quadrilateral is $HIJK$? Give reasons for your answer.

$m_{HI} = \frac{8-6}{5-0} = 0.4$

$m_{JK} = \frac{-4--2}{4-9} = 0.4$

$m_{IJ} = \frac{-2-8}{9-5} = -2.5$

$m_{KH} = \frac{4-6}{4-0} = -2.5$

HIJK is a rectangle because 2 pairs opp. sides parallel, diagonals are equal and bisect each other + opposite sides are equal ✓

**END OF TEST.**

**Use the rest of this page for extra working space.**

$HI = \sqrt{(0-5)^2 + (6-8)^2}$

$= \sqrt{29}$

$IJ = \sqrt{(5-9)^2 + (8--2)^2}$

$= \sqrt{116}$

$JK = \sqrt{(9-4)^2 + (-2--4)^2}$

$= \sqrt{29}$

$KH = \sqrt{(4-0)^2 + (-4-6)^2}$

$= \sqrt{116}$

**Topic test 7**

# Coordinate geometry

99%

Name: Renecia Dave

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 14 free-response questions (60 marks)

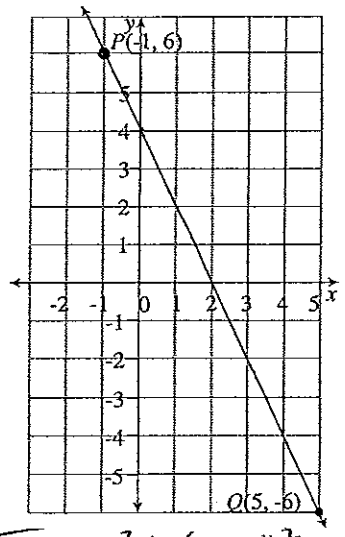
## Part A

**20 multiple-choice questions**
**2 marks each: 40 marks**
**Circle the correct answer.**

**1** A line that is perpendicular to another line with gradient -3 has a gradient of

A -1 B 3
C $\frac{1}{3}$ D $-\frac{1}{3}$

Questions **2** to **5** refer to the graph below.




$PQ = \sqrt{(-1-5)^2 + (6--6)^2}$
$= \sqrt{180} = 13.4$

**2** The length of interval $PQ$ is closest to:

A 10.4 units B 13.4 units
C 6.0 units D 12.6 units

**3** The gradient of interval $PQ$ is: $\frac{-6-6}{5--1} = -2$

A $\frac{1}{2}$ B $-\frac{1}{2}$
C 2 D -2

**4** The midpoint of interval $PQ$ is: $\frac{-1+5}{2}, \frac{6+-6}{2} = (2, 0)$

A (2, 6) B (3, -2)
C (2, 0) D (3, 0)

$y = -2x + 4$ Well done!

**5** The line through $PQ$ has equation:

A $y = 2x + 2$ B $y = -2x + 4$
C $y = -\frac{1}{2}x + 2$ D $y = \frac{1}{2}x + 4$

**6** What is the gradient of the line with equation $4x + 2y - 7 = 0$? $2y = -4x + 7$, $y = -2x + 3.5$, $m = -2$

A $\frac{1}{2}$ B $-\frac{1}{2}$
C 2 D -2

**7** Which one of the following lines is perpendicular to $y = \frac{1}{2}x - 2$?

A $y = 2x + 1$ B $y = -2x - 2$
C $y = -\frac{1}{2}x + \frac{1}{2}$ D $y = \frac{1}{2}x + 2$

**8** Find the equation of the line passing through the point (−4, 1) with gradient 2. $1 = (-4 \times 2) + b$, $b = 9$

A $y = 2x - 9$ B $y = 2x + 9$
C $y = 2x - 7$ D $y = 2x + 7$

$y = 2x + 9$

**9** The $x$-coordinate of the midpoint of the interval joining points $(x_1, y_1)$ and $(x_2, y_2)$ is: midpoint $x = \frac{x_1 + x_2}{2}$

A $\frac{x_1 + y_1}{2}$ B $\frac{x_1 + x_2}{2}$
C $\frac{x_2 - x_1}{2}$ D $\frac{y_2 - y_1}{x_2 - x_1}$

**10** The gradient of $y = \frac{3x}{4} + \frac{1}{2}$ is:

A $-\frac{1}{2}$ B $\frac{1}{2}$
C $-\frac{3}{4}$ D $\frac{3}{4}$

**11** The graph of $x = 0$:

A has zero gradient
B is the $x$-axis
C is the $y$-axis
D has no $y$-intercept

22

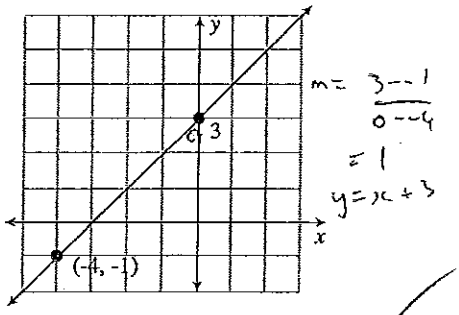
**12** Which line is parallel to $y = 2 + 3x$?

A $y = 3x + 6$ ✓
B $y = \frac{x}{3} + 2$
C $y = 3$
D $y = 1 - 3x$

**13** Which line has a gradient of -1?

A $y = -1$
B $y = x - 1$
C $y = -x + 1$ ✓
D $y = x + 1$

**14** What is the equation of this line?




A $y = x - 4$
B $y = x + 3$ ✓
C $y = -x + 3$
D $y = 2x + 7$

**15** Find the equation of the line that is parallel to $8x - 2y + 5 = 0$ and passes through the point (7, -5).

A $y = \frac{1}{4}x + \frac{13}{4}$
B $y = 4x + 27$
C $y = -4x + 23$
D $y = 4x - 33$ ✓

**16** Which line is parallel to $y = 4$?

A $y = 4x$
B $y = -1$ ✓
C $x = 4$
D $y = x - 4$

**17** Which one of these points lies on the line $2x + 3y = 9$?

A (2, 2)
B (6, -1) ✓
C (-2, 4)
D (0, -4)

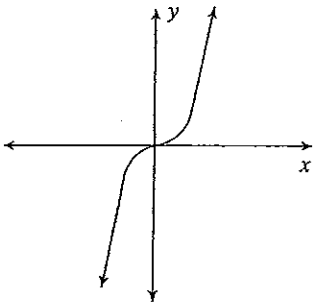
**18** $3x + 4y + 12 = 0$ can be rewritten as:

A $y = \frac{3}{4}x + 4$
B $y = -\frac{3}{4}x + 3$
C $y = \frac{3}{4}x - 4$
D $y = -\frac{3}{4}x - 3$ ✓

**19** Which one of these lines is not parallel to the other three?

A $y = 4 - x$ ✓
B $y = 6 - 4x$
C $-4x = y$
D $y = -4x + 10$

**20** What is the equation of this curve?

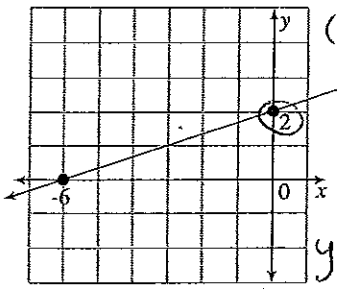



A $x + y = 1$
B $y = x^2$
C $y = 2^x$
D $y = x^3$ ✓

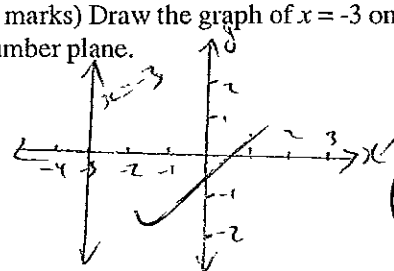
## Part B

**14 free-response questions**
**60 marks**
**Show working where appropriate.**

**21** (2 marks) Find the equation of this line.




**22** (2 marks) Draw the graph of $x = -3$ on a number plane.




**23** (3 marks) Find the equation of the line perpendicular to the line $y = 4 - x$ and passing through the point (8, 1).