High School
Mathematics Test 2013

Year 10

Non Linear Relations

Calculator Allowed

Skills and Knowledge Assessed:

- Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296)
- Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239)
- 10A Describe, interpret and sketch parabolas, hyperbolas, circles and exponential functions and their transformations (ACMNA267)

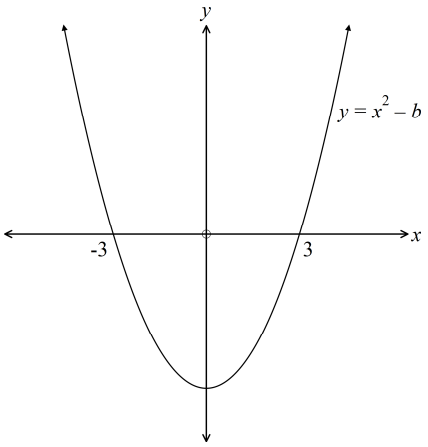
Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. The graph of $y = x^2 - b$ is shown.

What is the value of b ?



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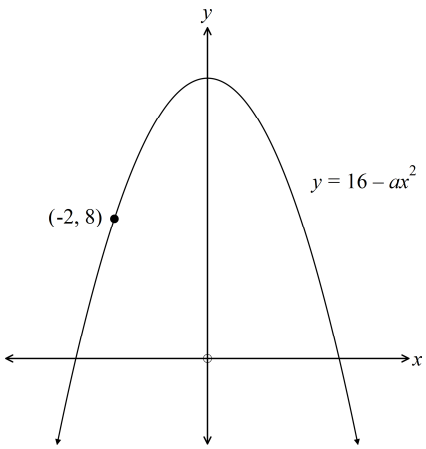
2. The equation of the graph shown is $y = 16 - ax^2$.
The graph passes through the point $(-2, 8)$.

What is the value of a ?



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3. The graph of $y = x^2 - 6x$ is shown.
The dotted line is its axis of symmetry.

What are the coordinates of the points A and B?

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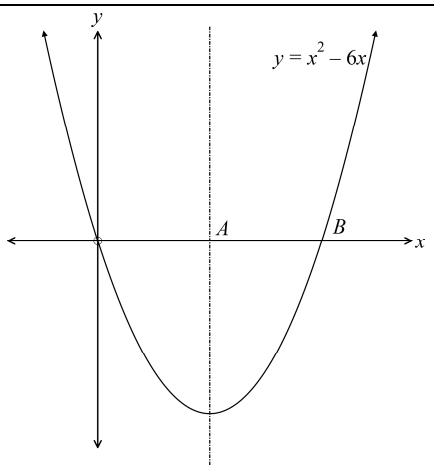

4. The curve below has equation $y = (x - 5)(x + 3)$.
What are the coordinates of the points C and D ?

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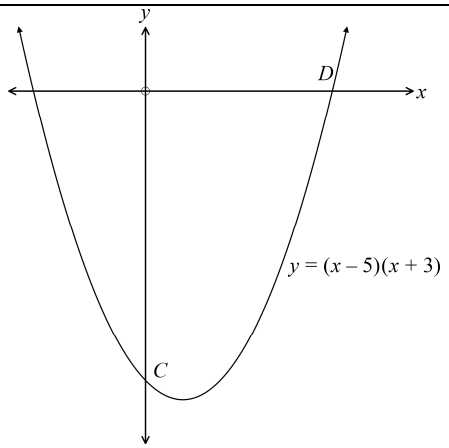

5. The graph of $y = 2^x$ is shown. Describe the intercept(s) that this graph has with the x and y axes.

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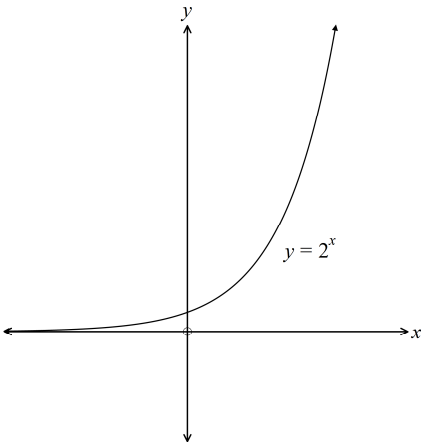

6. What is the equation of the circle shown?

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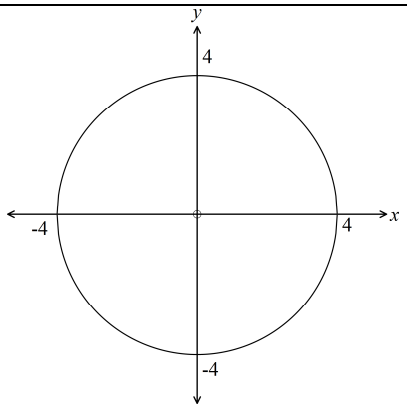

7. Complete the table of values for the equation

$$y = \frac{1}{x-3}$$

x	1	2	4	5
y				

8. Why would there be no point where $x=3$, on the graph of the relation in question 7.

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9. The graph of $y = 3^x$ is shown.
Draw a quick sketch, on the same set of axes, of $y = 3^x + 3$.

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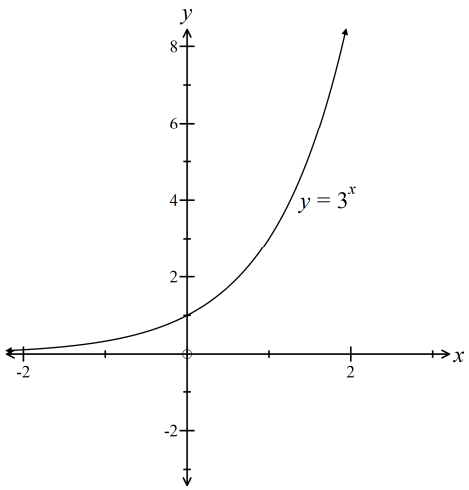

10. What is the centre and radius of the circle which has an equation of $(x-2)^2 + (y+5)^2 = 25$

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High School
Mathematics Test 2013
Non Linear Relations

Year 10

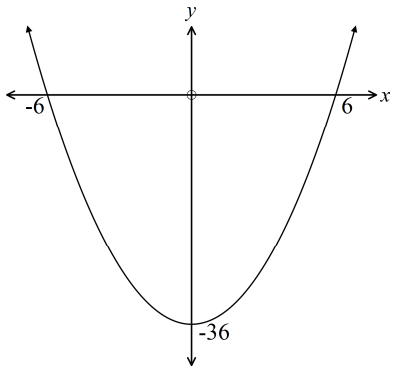
Calculator Allowed Section

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. Which equation could describe the graph shown?



A. $y = x^2 - 6$

B. $y = x^2 + 6$

C. $y = x^2 - 36$

D. $y = x^2 + 36$

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2. Which equation below would represent a parabola?

A. $y = \frac{4}{x-3}$

B. $y = 5x - 2$

C. $y = x^2 + 2x$

D. $3x - 4y + 7 = 0$

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3. Which graph does <u>not</u> include the point $(-2, 3)$?

A. $y = 2x^2 - 5$ B. $y = x^2 - 1$ C. $y = 7 - x^2$ D. $y = x^2 + 1$

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4. A circle on the number plane with centre at the origin and a radius of 9 units would have as its equation:

A. $x^2 + y^2 = 3$.

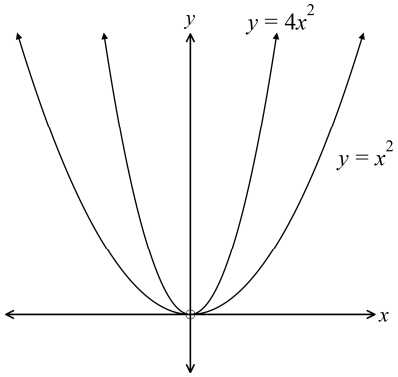
B. $x^2 + y^2 = 9$.

C. $x^2 + y^2 = 18$.

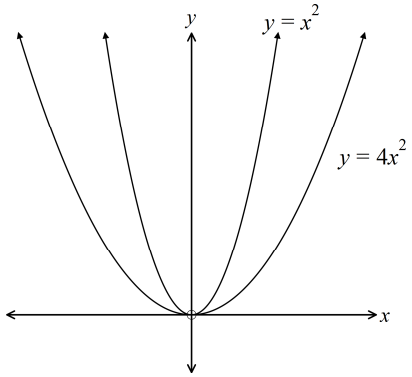
D. $x^2 + y^2 = 81$.

5. Which diagram below correctly shows the graphs of $y = x^2$ and $y = 4x^2$? ?

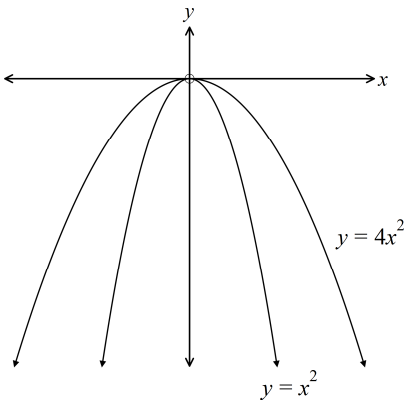
A.



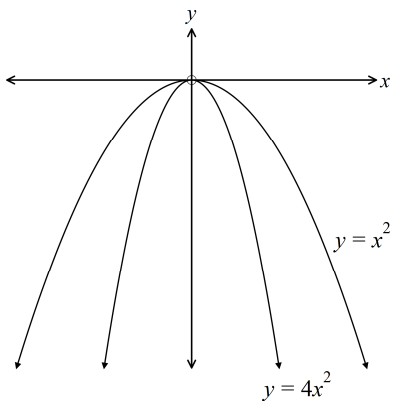
B.



C



D.



6. The graph of $x^2 + y^2 = 36$ would have y intercepts at:

A. $y = 0$ and $y = 6$

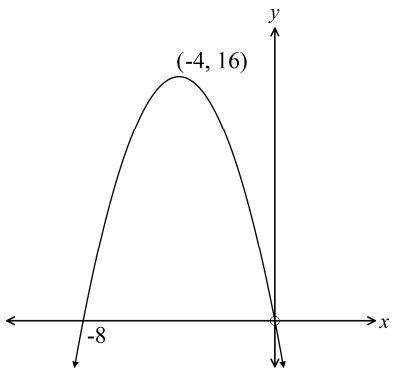
B. $y = -6$ and $y = 6$

C. $y = 0$ and $y = 36$

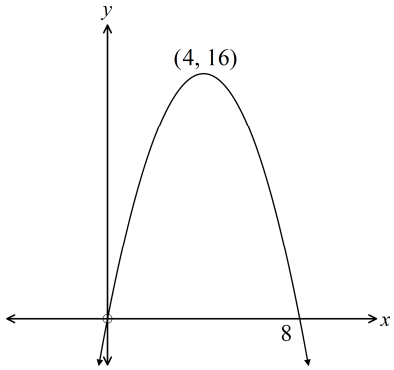
D. $y = -36$ and $y = 36$

7. Which diagram shows the graph of $y = x(8 - x)$?

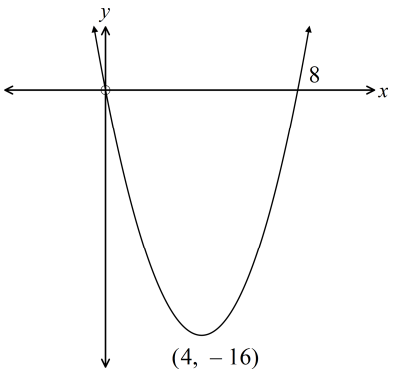
A.



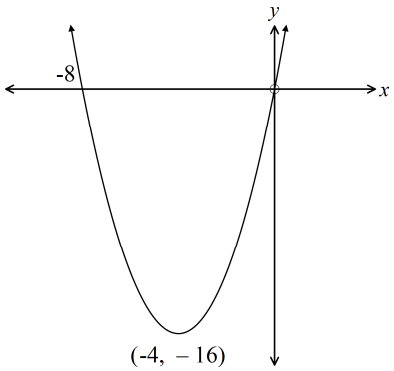
B.



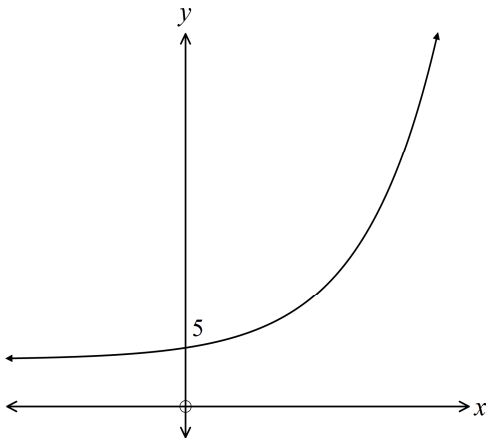
C.



D.



8. Which equation could describe the graph shown?



A. $y = 2^x + 4$

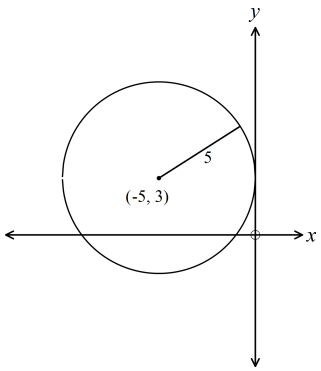
B. $y = 2^x + 5$

C. $y = x^2 + 4$

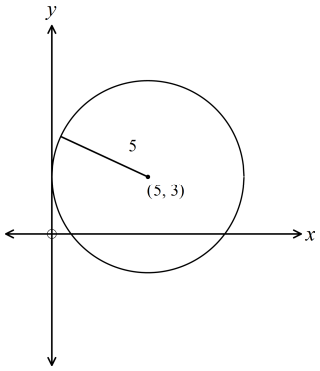
D. $y = x^2 + 5$

9. Which diagram shows the graph of $(x-5)^2 + (y-3)^2 = 25$?

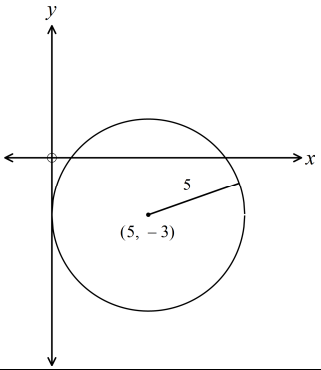
A.



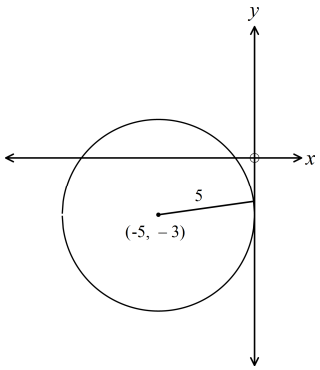
B.



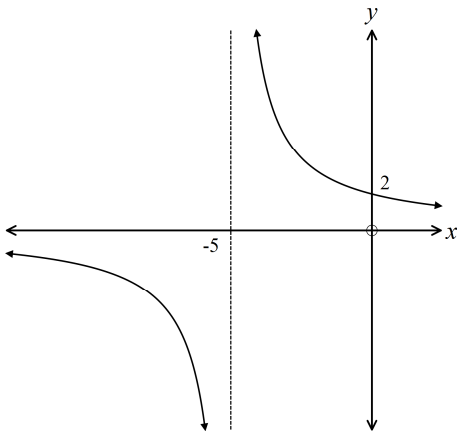
C.



D.



10. The graph shown would have equation:



A. $y = \frac{1}{x-5}$

B. $y = \frac{10}{x-5}$

C. $y = \frac{1}{x+5}$

D. $y = \frac{10}{x+5}$

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Calculator Allowed Section

Name_____

Section 3 Longer Answer Section

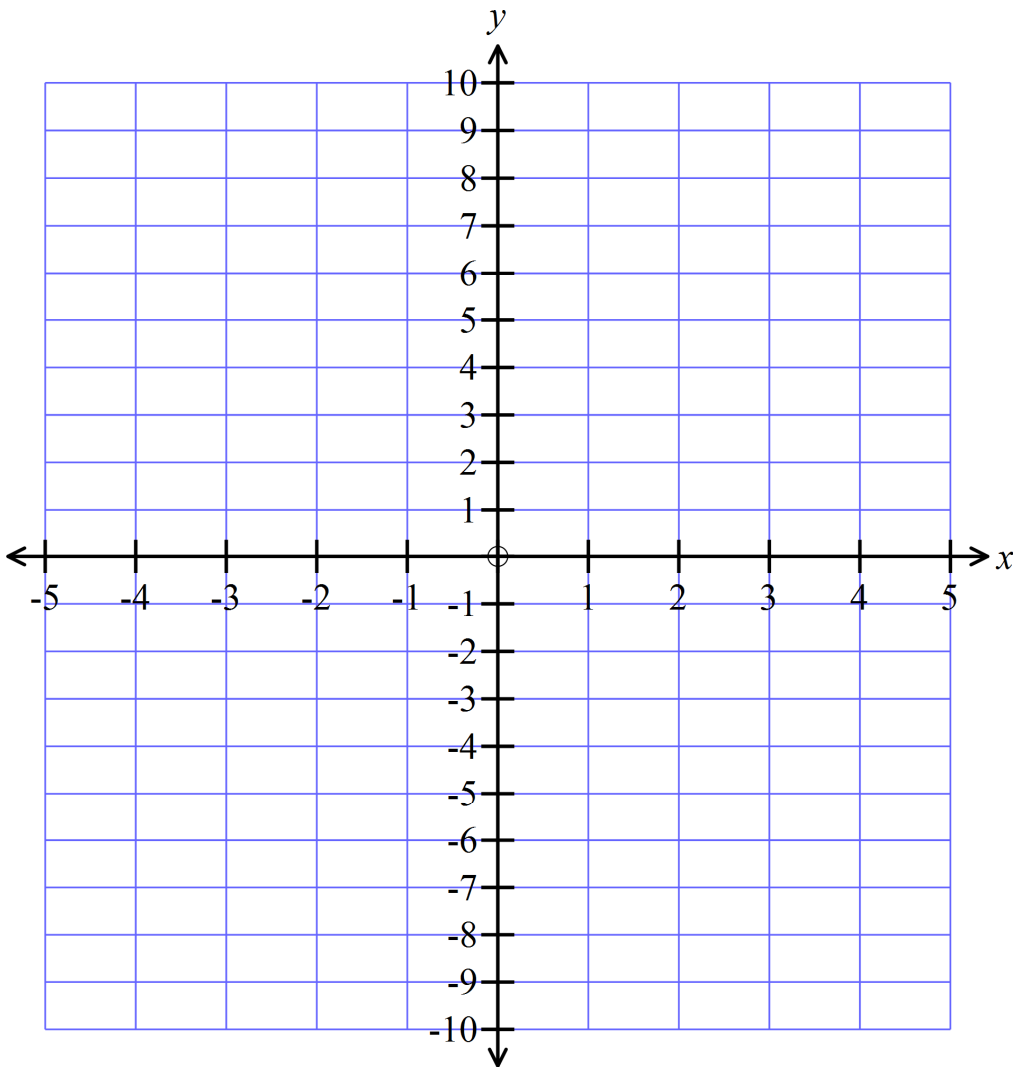
Write all working and answers in the spaces provided on this test paper.

Marks

1. **4**

On the axes provided draw neat sketches of $y = \frac{x^2}{2}$ and $y = x^2 - 3x - 4$.

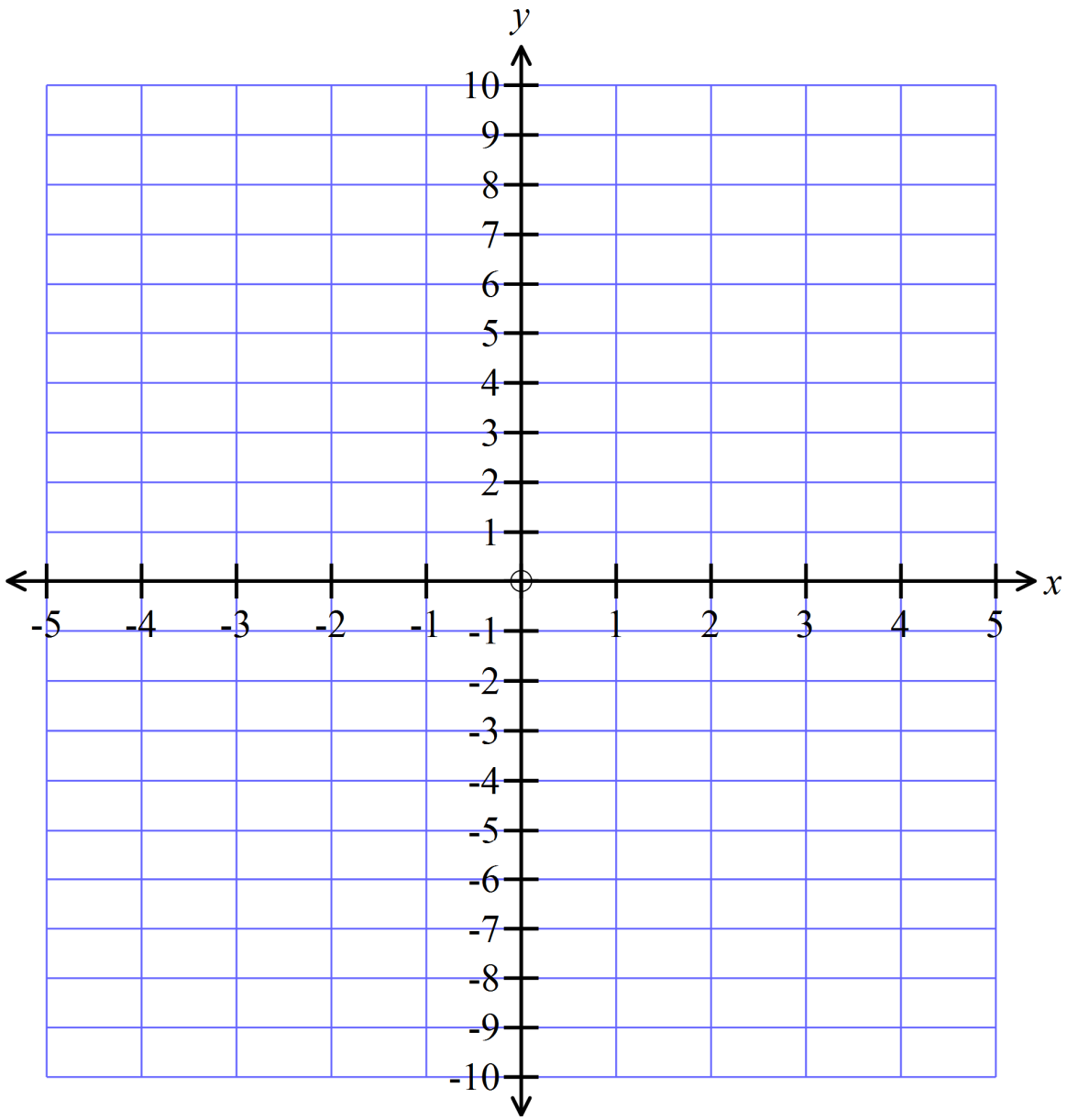
Clearly mark the x and y intercepts and the vertex of each graph.



Marks

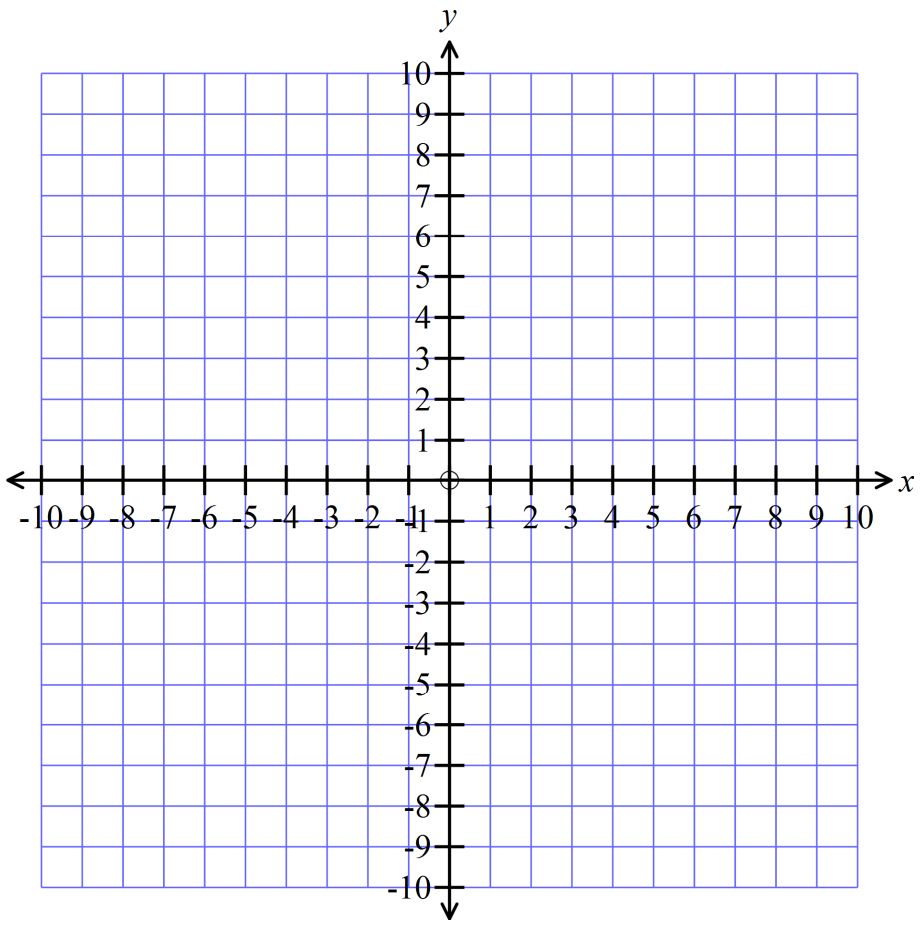
2. On the axes provided draw neat sketches of $y = 2^x - 1$ and $y = \frac{1}{x} + 1$. **4**

Clearly mark the x and y intercepts and the vertex of each graph.



Marks

3. On the axes provided draw neat sketches of $x^2 + y^2 = 4$ and $x^2 - 4x + y^2 + 6y - 12 = 0$. **4**
Clearly mark the x and y intercepts and the vertex of each graph.



High School
Mathematics Test 2013

Multiple Choice Answer Sheet

Name _____

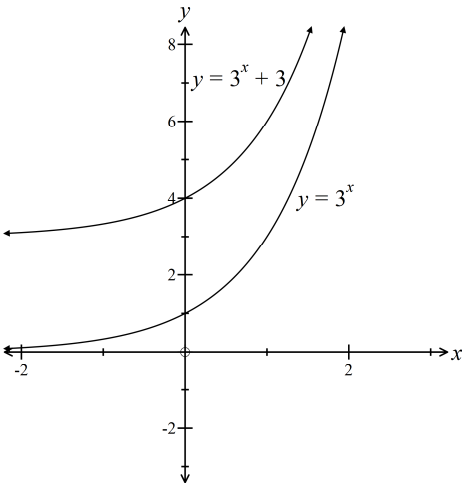
Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭

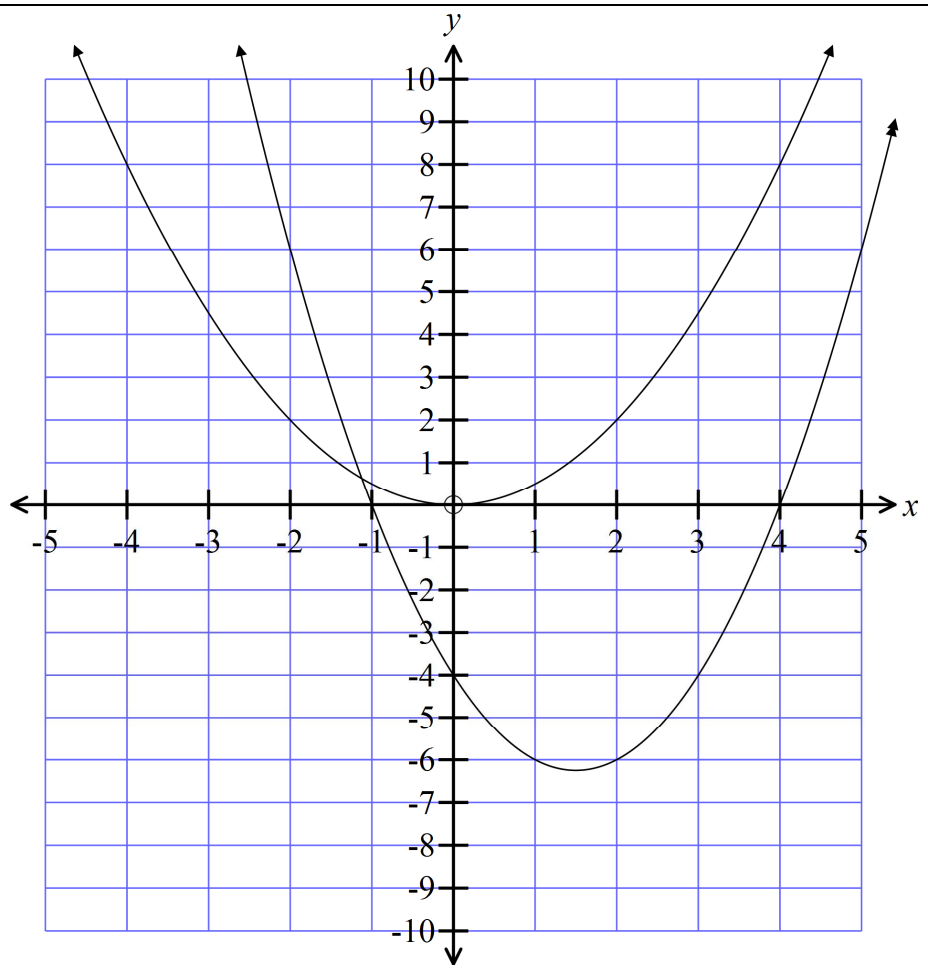
High School
Mathematics Test 2013
Non Linear Relations

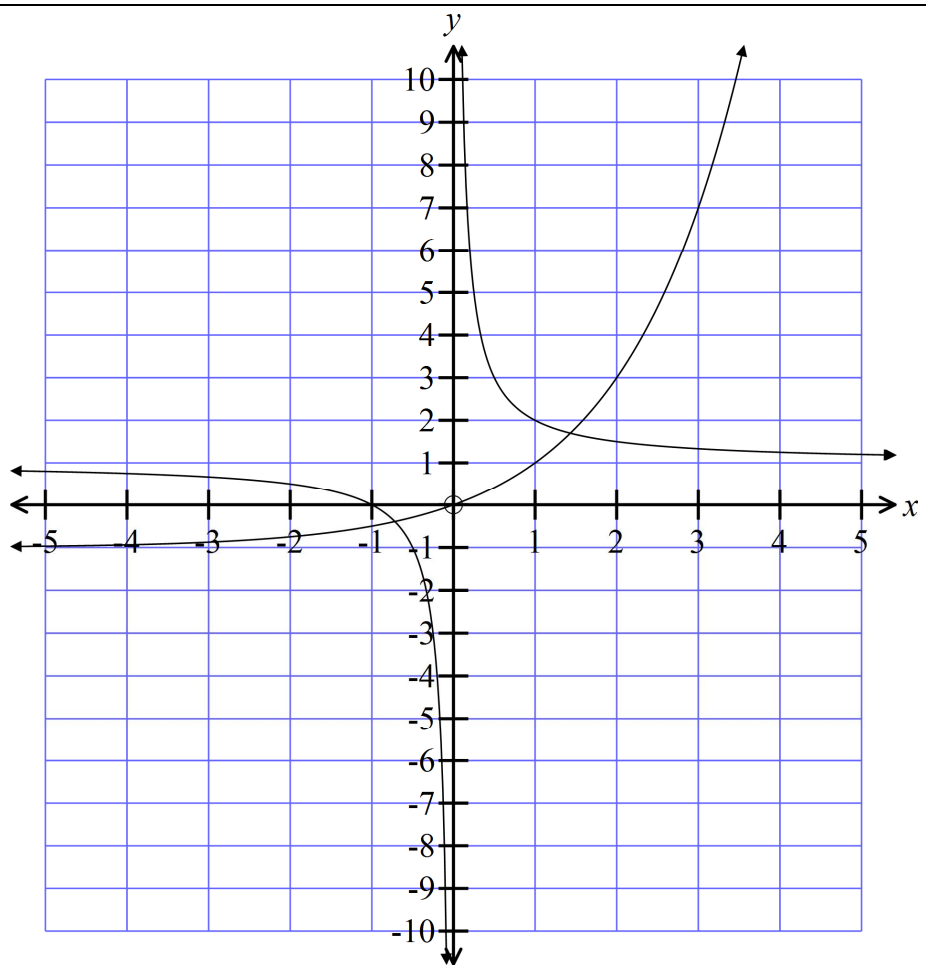
ANSWERS

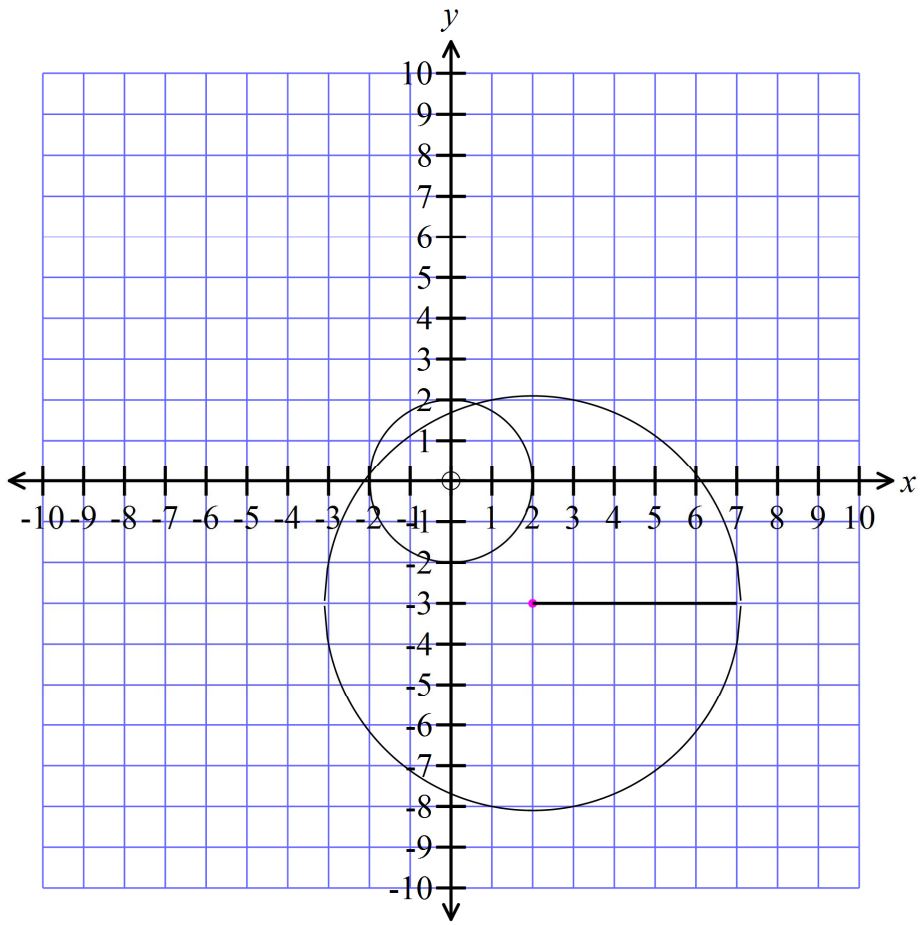
<table>
<tr><th colspan="2">Section 1</th></tr>
<tr><td>1.</td><td>$y = x^2 - b$
$y = (x - 3)(x + 3)$
$y = x^2 - 9$
So $x = 9$</td></tr>
<tr><td>2.</td><td>$y = 16 - ax^2$
$8 = 16 - a\,(-2)^2$
$-8 = -4a$
$a = 2$</td></tr>
<tr><td>3.</td><td>$y = x^2 - 6x$
$y = x(x - 6)$
x intercepts when $y = 0$, $x = 0$ or $x = 6$
Axis is $x = 3$
So $A = (3,0)$ and $B = (6,0)$.</td></tr>
<tr><td>4.</td><td>$y = (x - 5)(x + 3)$
x intercepts when $y = 0$; $x = -3$ and $x = 5$
y intercepts when $x = 0$; $y = (-5)(3) = -15$
So $C = (0, -15)$ and $D = (5,0)$</td></tr>
<tr><td>5.</td><td>The graph intercepts the y axis at $y = 2^0 = 1$
There is no intercept on the x axis.</td></tr>
<tr><td>6.</td><td>$x^2 + y^2 = r^2$
$x^2 + y^2 = 16$</td></tr>
<tr><td>7.</td><td>
<table>
<tr><td>x</td><td>1</td><td>2</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>$-\frac{1}{2}$</td><td>-1</td><td>1</td><td>$\frac{1}{2}$</td></tr>
</table>
</td></tr>
<tr><td>8.</td><td>Substituting $x = 3$ into $y = \frac{1}{x-3}$ gives $\frac{1}{0}$ which is undefined,
so there is no point which has $x = 3$.</td></tr>
</table>

9.	
10.	$(x-2)^2 + (y+5)^2 = 25$ $(x-a)^2 + (y-b)^2 = r^2$ Centre (2, -5) , radius = 5.

Section 2	
1.	C
2.	C
3.	D
4.	D
5.	A
6.	B
7.	B
8.	A
9.	B
10.	D

Section 3		
1.		2 marks for each graph. 1 mark for general shape correctand 1 mark for specific details correct.

		2 marks for each graph. 1 mark for general shape correctand 1 mark for specific details correct

		2 marks for each graph. 1 mark for general shape correctand 1 mark for specific details correct

High School
Mathematics Test 2013

Multiple Choice Answer Sheet

Name Marking Sheet

Completely fill the response oval representing the most correct answer.

1.	A ○	B ○	C ●	D ○
2.	A ○	B ○	C ●	D ○
3.	A ○	B ○	C ○	D ●
4.	A ○	B ○	C ○	D ●
5.	A ●	B ○	C ○	D ○
6.	A ○	B ●	C ○	D ○
7.	A ○	B ●	C ○	D ○
8.	A ●	B ○	C ○	D ○
9.	A ○	B ●	C ○	D ○
10.	A ○	B ○	C ○	D ●