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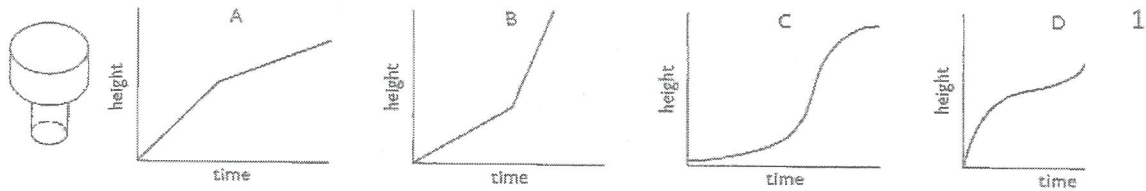
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# Year 10 Non-linear relationships practise test

Name: Ansress.

Give yourself 50 minutes to complete this test.

1.

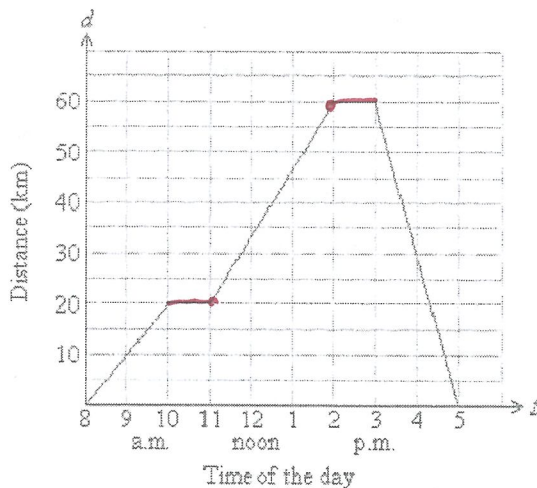


A funnel was closed at the base with a stopper, then filled with water at a constant rate. Which graph best shows the change in depth against time?

Answer A

2.

The following graph gives the distance of a cyclist from his home.



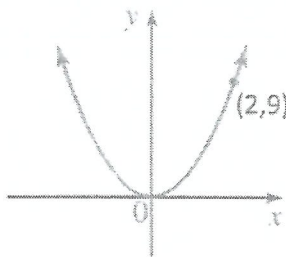
- What was the total distance travelled by the cyclist?  $60 \text{ km} \times 2 = 120 \text{ km}$  1
- For how long did the cyclist stop? 2 hours total 1
- Between what hours was the cyclist travelling the fastest? 3-5 pm 1
- What was the speed travelled by the cyclist between 11am and 2pm? 1

$$\frac{40 \text{ km}}{3 \text{ hours}} = 13 \frac{1}{3} \text{ km/h}$$

3.

The curve below is a parabola with equation of the form  $y = ax^2$ , where  $a$  is a constant. Find the value of  $a$  if the point  $(2,9)$  lies on the parabola. Hence determine its equation.

2



sub in  $(2,9)$

$$9 = a \times (2)^2$$

$$a = \frac{9}{4}$$

4.

$$\therefore y = \frac{9}{4}x^2$$

Match each of these equations with one of the graphs below.

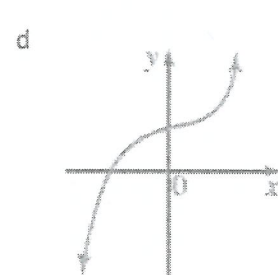
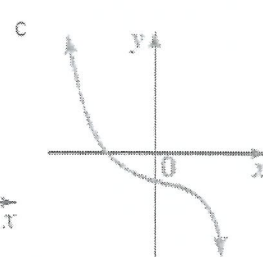
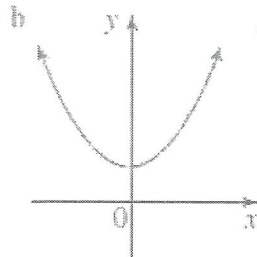
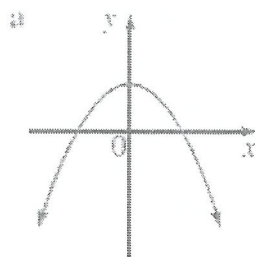
2

$y = x^2 + 3$  b

$y = -x^3 - 2$  c

$y = 3 - x^2$  a

$y = x^3 + 2$  d



5.

a Complete the table of values and graph the parabola,  $y = x^2 + 5x + 6$ . Number and label your axes. Label your graph.

2

x	-5	-4	-3	-2.5	-2	-1	0
y	6	2	0	-0.25	0	2	6

b What are the x intercepts?

$-3, -2$

c What is the y intercept?

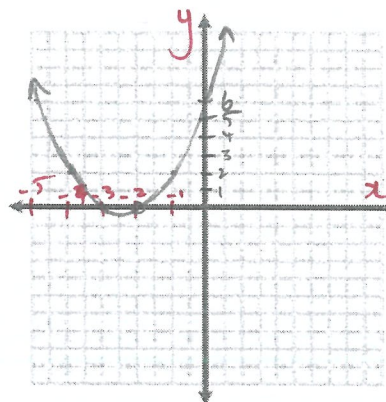
6

d What is the axis of symmetry?

$x = -2.5$

e What is the vertex?

$(-2.5, -0.25)$



4

6.

a. Graph the parabola,  $y = 2(x+1)^2$  clearly showing the vertex and y-intercept

2

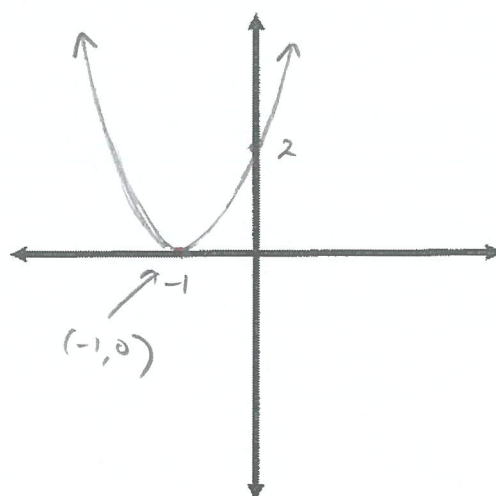
b. What is the equation of the axis of symmetry?

$x = -1$

c. Prove the parabola passes through the point (4,50)

sub in (4,50)

$$\begin{aligned} 50 &= 2(4+1)^2 \\ &= 2 \times 5^2 \\ &= 2 \times 25 \\ &= 50 \end{aligned}$$



3

7. which is true.  $\therefore (4,50)$  passes through.

A parabola has the equation  $y = x^2 - 4x + 1$

a) Complete the square, and hence write down the coordinates of the vertex.

$$\begin{aligned} y &= x^2 - 4x + 4 - 4 + 1 \\ &= (x-2)^2 - 3 \\ \therefore \text{vertex at } (2, -3) \end{aligned}$$

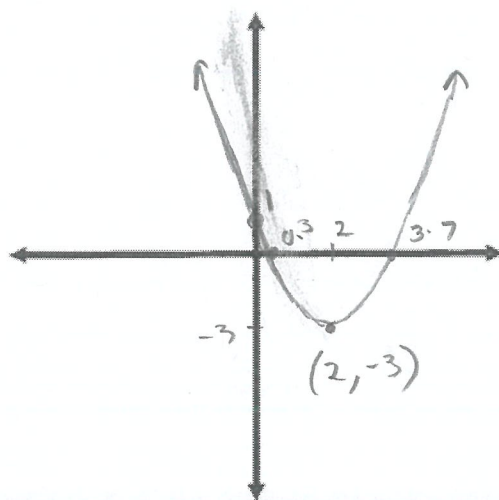
(3)

b) Use the quadratic formula to find the solutions when  $y = 0$ . Give your answers correct to 1 decimal place.

$$\begin{aligned} x &= \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 1 \times 1}}{2 \times 1} \\ &= \frac{4 \pm \sqrt{12}}{2} \doteq 3.7, 0.3 \text{ (1 d.p.)} \end{aligned}$$

(3)

c) Hence, sketch the parabola, showing coordinates of the vertex, x-intercepts and y-intercept.

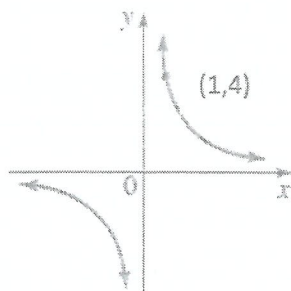


(3)

8.

Find the equation of the hyperbola and the equations of the asymptotes.

2



$$y = \frac{a}{x} \quad \text{sub in } (1, 4)$$

$$4 = \frac{a}{1}$$

$$a = 4$$

$$\therefore y = \frac{4}{x}$$

asymptotes at  $y=0$  and  $x=0$

9.

Select one description from the list to explain how each of these curves differs from  $y = x^4$   
(concave down, moved to the left, moved to the right)

a.  $y = -x^4$  concave down

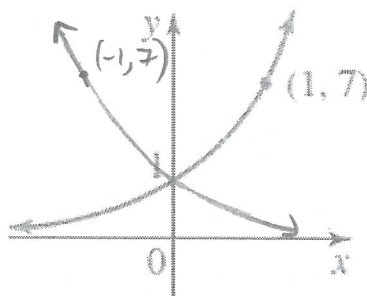
b.  $(x-1)^4$  moved to right  
(translated)

2

10.

This is the graph of  $y = 7^x$ . On the same number plane sketch  $y = 7^{-x}$ .

1



11.

Do all exponential curves with equations of the form  $y = a^x$  ( $a > 0$ ) have the same y-intercept? Select: Yes or No Justify/Explain your answer.

2

because when  $x=0$ ,  $a^0 = 1$   
the y-intercept is always 1.

12. Sketch the following equations:

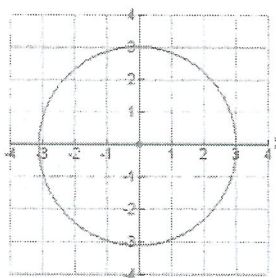
(8)

Equation	$y = (x + 4)^3$	$y = -\frac{4}{x}$
Sketch		
Equation	$y = 3^x + 2$	$x^2 + y^2 = 9$
Sketch		

13.

State the equation of the circle.

1



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

14.

Find the centre and the radius of the circle given in the equation.

2

$$4(x - 3)^2 + 4(y + 1)^2 = \frac{1}{4}$$

$$(x - 3)^2 + (y + 1)^2 = \frac{1}{16}$$

$$\text{centre} = (3, -1)$$

$$\text{radius} = \frac{1}{4}$$



15.

Find the centre and the radius of the circle given in the equation:

3

$$x^2 + y^2 - 4x + 10y + 14 = 0$$

$$x^2 - 4x + \underline{4} + y^2 + 10y + \underline{25} = -14 + \underline{4} + \underline{25}$$

$$(x-2)^2 + (y+5)^2 = 15$$

centre  $(2, -5)$

radius  $\sqrt{15}$

(to be completed after correcting the test)

### Self-Evaluation (to be completed after correcting the test)

The things I did well with were:

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The areas that need improvement are:

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The **specific** actions I am going to take to improve my weaknesses are:

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### Checklist:

[illegible]