

Cubic, reciprocal and exponential graphs

About 50 minutes Calculator allowed 45 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-cubic-reciprocal-and-exponential-graphs/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

A1 Needed today [2 marks] **A2** From chapter 23 [2 marks]

Find the coordinates of the turning point of $y = (x - 7)(x + 5)$.

Use the trapezium rule with 3 strips of width 1 to estimate the area under $y = x^2 + 8$ from $x = 4$ to $x = 7$.

Answer

Answer

A3 From chapter 8 [2 marks] **A4** From chapter 15 [2 marks]

Factorise fully $9x^2y - 12xy^2$.

Solve $2x - 2 \geq 7x - 7$.

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

The curve $y = ab^x$ passes through (0, 6) and (3, 48). Find a and b .

Hint Put $x = 0$ in first: $b^0 = 1$. Then use the second point.

B1 The curve $y = ab^x$ passes through (0, 4) and (2, 100). [3 marks]

Find a and b , then work out y when $x = 3$.

Answer $a = \dots\dots$ $b = \dots\dots$ $y = \dots\dots$

EXAMPLE 2

For the curve $y = (x + 1)(x - 2)(x - 4)$, find where it crosses the x -axis and where it crosses the y -axis.

Hint $y = 0$ when any one bracket is 0. Put $x = 0$ in for the y -axis.

B2 For the curve $y = (x + 3)(x - 1)(x - 5)$, find [3 marks]

where it crosses the x -axis and where it crosses the y -axis.

Answer $x = \dots\dots, \dots\dots, \dots\dots$ (0, $\dots\dots$)

C Practice

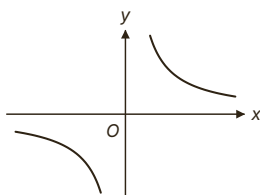
- C1** The point $(x, 4.5)$ lies on the curve $y = \frac{54}{x}$. Work out x . [2 marks]

Answer

- C2** Work out the value of $y = 6^x$ when $x = -2$. Give your answer as a fraction. [2 marks]

Answer

- C3** The sketch shows a curve. Which of $y = x^3 - 7x$, $y = \frac{7}{x}$ and $y = 7^x$ could it be? [1 mark]



Answer

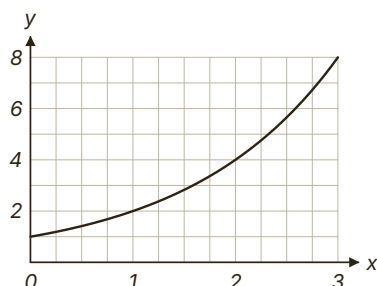
- C5** The curve $y = \frac{36}{x}$ and the line $y = 4x$ meet at two points. Work out the coordinates of both points. [3 marks]

Answer $(\dots, \dots)$ and $(\dots, \dots)$

- C6** A car is worth £18000. Its value after t years is $V = 18000 \times 0.88^t$. Work out its value after 3 years, to the nearest pound. [2 marks]

Answer £

- C7** The graph of $y = 2^x$ is drawn. Use the graph to estimate the solution of $2^x = 6$. [2 marks]



Answer $x = \dots$

- C8** The curve $y = \frac{k}{x}$ passes through the point $(-2, 5)$. Find k . In which two quadrants does the curve lie? [2 marks]

Answer $k = \dots$ quadrants

D Exam-style questions

- D1** Owen says, "The curve $y = \frac{12}{x}$ crosses the y -axis at $(0, 12)$." [2 marks]
- Explain why Owen is wrong.

- D2** A lake is stocked with fish. The number of fish, N , t years after the first count is modelled by $N = ab^t$. After 1 year there are 800 fish. After 3 years there are 1250 fish.
- (a) Show that $b = 1.25$ [2 marks]
- (b) Work out the number of fish at the first count. [2 marks]
- Answer
- (c) Use the model to work out the number of fish after 5 years. Give your answer to the nearest whole number. [2 marks]
- Answer

Total for D2: 6 marks

- D3** The curve $y = 2x^3 - 50x$ crosses the x -axis at three points. Work out the x -coordinate of each point. You must show your working. [3 marks]

Answer $x = \dots\dots$, $\dots\dots$ and $\dots\dots$

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** The graph of $y = x^3 + px$ passes through the point $(5, 80)$. Find the value of p , and find the three values of x where the graph crosses the x -axis. [4 marks]

Answer $p = \dots\dots$ $x = \dots\dots$, $\dots\dots$, $\dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Put $x = 5$, $y = 80$ in.
Hint 2 $125 + 5p = 80$.
Hint 3 $x^3 - 9x = x(x - 3)(x + 3)$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can work out values on cubic, reciprocal and exponential curves. ☐ ☐ ☐

I can tell those three kinds of graph apart. ☐ ☐ ☐

I can find a and b for $y = ab^x$ from two points. ☐ ☐ ☐