

GCSE Maths: Exponential graphs, growth and decay (Higher): answers

GCSE Maths - Functions and Advanced Graphs - Higher - Lesson 25.6

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/exponential-graphs-growth-and-decay/

Exercise 25F Exponential graphs, growth and decay Calculator allowed

1 Complete a table of values for each function and describe what happens to y as x increases.

(a) $y = 2^x$, for $x = -2, 0, 2, 4$

Answer: 0.25, 1, 4, 16

(b) $y = 3^x$, for $x = -2, -1, 0, 1, 2$

Answer: $\frac{1}{9}$, $\frac{1}{3}$, 1, 3, 9

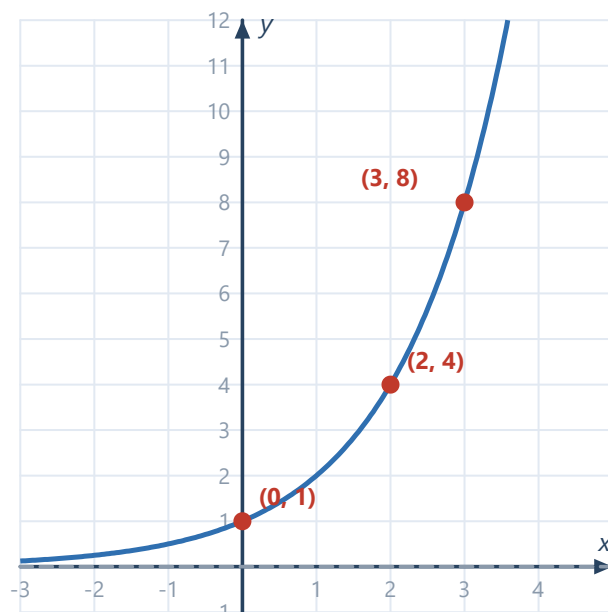
(c) $y = 10^x$, for $x = -2, -1, 0, 1, 2$

Answer: 0.01, 0.1, 1, 10, 100

(d) $y = 0.5^x$, for $x = -3, -1, 0, 2, 4$

Answer: 8, 2, 1, 0.25, 0.0625

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



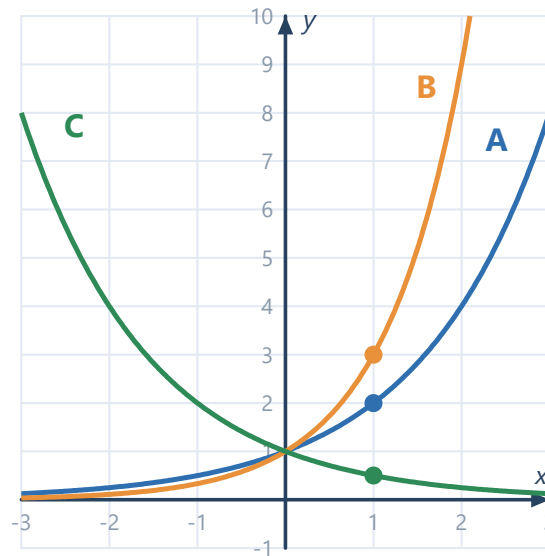
(a) Use the graph to estimate the value of $2^{2.5}$.

Answer: about 5.7

- (b) Use the graph to estimate the value of x when $2^x = 10$.

Answer: about 3.3

- 3 The diagram shows the graphs of $y = 2^x$, $y = 3^x$ and $y = (1/2)^x$. Match each equation to a graph A, B or C.



- (a) $y = 2^x$

Answer: A

- (b) $y = 3^x$

Answer: B

- (c) $y = (1/2)^x$

Answer: C

- 4 Is each function an example of exponential growth or exponential decay?

- (a) $y = 1.05^x$

Answer: growth

- (b) $y = 0.9^x$

Answer: decay

- (c) $y = 7^x$

Answer: growth

- (d) $y = 0.75^x$

Answer: decay

- (e) $y = 0.99^x$

Answer: decay

- 5 Solve each equation by trying whole-number powers.

(a) $2^x = 32$

Answer: $x = 5$

(b) $3^x = 81$

Answer: $x = 4$

(c) $5^x = 0.04$

Answer: $x = -2$

(d) $0.5^x = 64$

Answer: $x = -6$

- 6 £3000 is invested at 4% compound interest per year. How much is it worth after 6 years? Give your answer to the nearest penny.

Answer: £3795.96

- 7 The population of a town is 24 000 and grows by 2.5% each year. Estimate the population after 8 years. Give your answer to the nearest hundred.

Answer: 29,200 (the calculation gives 29242)

- 8 A motorbike costs £9500 new and loses 12% of its value each year. Work out its value after 4 years to the nearest £10.

Answer: £5700 (the calculation gives £5697.11)

- 9 A sample of a radioactive substance has a mass of 500 g. Its mass falls by 6% each day. Work out the mass after 10 days. Give your answer to 3 significant figures.

Answer: 269 g

- 10 £800 is invested at 3% compound interest per year. How many whole years will it take to reach at least £1000?

Answer: 8 years

- 11 A patient takes 200 mg of a drug. Each hour, 20% of the drug in the body is removed. After how many hours is there first less than 50 mg left in the body?

Answer: 7 hours

- 12 The mass of a sample is $M = 80 \times (1/2)^{t/5}$ grams after t days, so the mass halves every 5 days. Work out the mass after

(a) 5 days

Answer: 40 g

(b) 15 days

Answer: 10 g

(c) 25 days

Answer: 2.5 g

- 13 Each graph has the form $y = a \times k^x$ and passes through the two points given. Find a and k .

(a) (0, 3) and (4, 48)

Answer: $y = 3 \times 2^x$

(b) (0, 5) and (3, 135)

Answer: $y = 5 \times 3^x$

(c) (0, 2) and (2, 50)

Answer: $y = 2 \times 5^x$

- 14** £1000 is invested at a fixed annual compound interest rate. After 3 years it is worth £1331. Find the annual percentage rate.

Answer: 10%

- 15** Jo is offered two savings plans for £100. Plan A adds £10 at the end of each year. Plan B adds 10% of the current balance at the end of each year. Which plan is worth more after 20 years, and by how much? Explain why the difference grows.

Answer: Plan B by £372.75

- 16** For the graph of $y = 2^x$, work out the average rate of change (gradient of the chord) from $x = 0$ to $x = 1$ and from $x = 3$ to $x = 4$. What does this tell you about the graph?

Answer: 1 and 8; the graph gets steeper

- 17** Mia says: "If I keep going far enough left, the graph of $y = 2^x$ will eventually touch the x -axis." Is she right? Use values of 2^x to explain.

Answer: No: the values get closer to 0 but are never 0

- 18** A graph with equation $y = a \times b^x$ (where $b > 0$) passes through (1, 6) and (3, 24). Find the values of a and b .

Answer: $a = 3$, $b = 2$