

GCSE Maths Functions and Advanced Graphs (Higher): check-up and exam-style questions: answers

GCSE Maths - Functions and Advanced Graphs - Higher - Test yourself

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/check-up-and-exam-style-questions/

Exercise 25Z Check-up (non-calculator) Non-calculator

1 $f(x) = 3x^2 - 2$. Work out $f(-2)$.

Answer: 10

2 $g(x) = 2x + 7$. Solve $g(x) = 15$.

Answer: $x = 4$

3 $f(x) = \frac{x+5}{2}$. Find $f^{-1}(x)$.

Answer: $2x - 5$

4 $f(x) = 2x - 1$ and $g(x) = x^2$. Find $fg(x)$.

Answer: $2x^2 - 1$

5 The point (2, 5) is on the graph of $y = f(x)$. Write down the coordinates of the corresponding point on the graph of $y = f(x - 3) + 1$.

Answer: (5, 6)

6 Write down the equation of the circle with centre (0, 0) and radius 6.

Answer: $x^2 + y^2 = 36$

7 Is the point (4, 3) inside, outside or on the circle $x^2 + y^2 = 25$?

Answer: on

8 Write down the equation of the tangent to the circle $x^2 + y^2 = 25$ at the point (0, 5).

Answer: $y = 5$

9 A speed-time graph is made of straight lines joining (0, 0), (10, 20) and (30, 20), with time in seconds and speed in m/s. Work out the distance travelled in the first 30 seconds.

Answer: 500 m

10 Solve $3^x = 1/9$.

Answer: $x = -2$

Exercise 25X Exam-style questions Non-calculator

1 $f(x) = 5 - 2x$. (a) Work out $f(-3)$. (b) Solve $f(x) = 9$.

[4 marks]

- (a) Work out $f(-3)$.

Answer: 11

- (b) Solve $f(x) = 9$.

Answer: $x = -2$

2 $f(x) = \frac{3x+1}{2}$. Find $f^{-1}(x)$.

[3 marks]

Answer: $\frac{2x-1}{3}$

3 $f(x) = 2x + 3$ and $g(x) = x^2 - 4$. (a) Find $fg(x)$. (b) Solve $gf(x) = 21$.

[6 marks]

- (a) Find $fg(x)$.

Answer: $2x^2 - 5$

- (b) Solve $gf(x) = 21$.

Answer: $x = -4$ or $x = 1$

4 The graph of $y = f(x)$ has a minimum point at $(3, -2)$. Write down the coordinates of the minimum point of

(a) $y = f(x - 1) + 4$, (b) $y = f(2x)$, and say what happens to the graph of $y = -f(x)$.

[5 marks]

- (a) $y = f(x - 1) + 4$

Answer: $(4, 2)$

- (b) $y = f(2x)$

Answer: $(1.5, -2)$

- (c) $y = -f(x)$

Answer: The graph is reflected in the x -axis, so the minimum becomes a maximum at $(3, 2)$

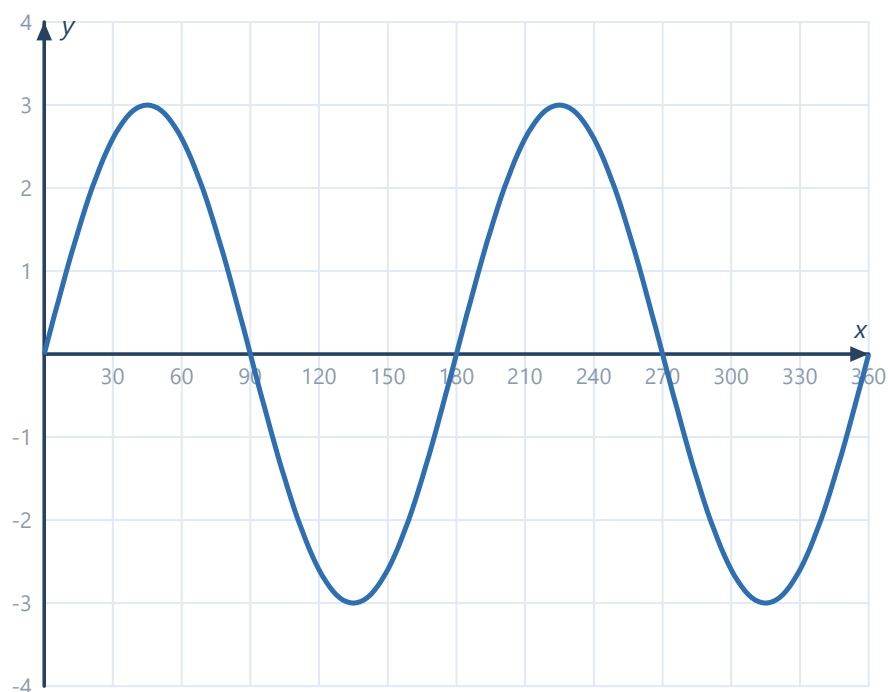
5 Solve $\sin x = 0.7$ for $0^\circ \leq x \leq 360^\circ$. Give your answers to 1 decimal place.

[3 marks]

Answer: 44.4, 135.6

6 The graph shows $y = a \sin(bx)$ for $0^\circ \leq x \leq 360^\circ$. Find the values of a and b .

[3 marks]



Answer: $a = 3, b = 2$

- 7** £6000 is invested for 4 years at 2.5% per year compound interest. Work out the value of the investment at the end of 4 years. Give your answer to the nearest penny. [3 marks]

Answer: £6622.88

- 8** A van costs £18 000 new. Its value falls by 14% each year. (a) Work out its value after 5 years, to the nearest £. (b) After how many whole years is it first worth less than £8000? [5 marks]

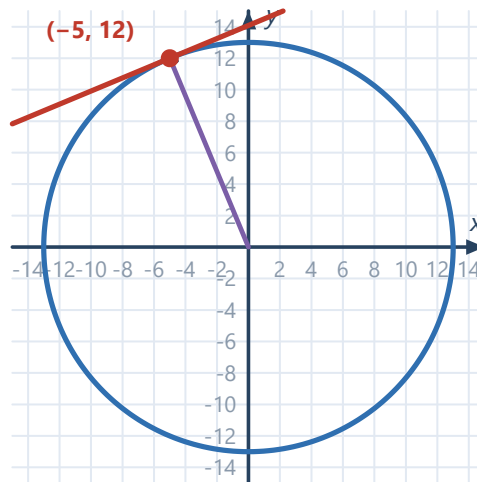
(a) Value after 5 years

Answer: £8,468

(b) First year below £8000

Answer: 6 years

- 9** The circle C has equation $x^2 + y^2 = 169$. The point $P(-5, 12)$ is on C . Find the equation of the tangent to C at P . [4 marks]

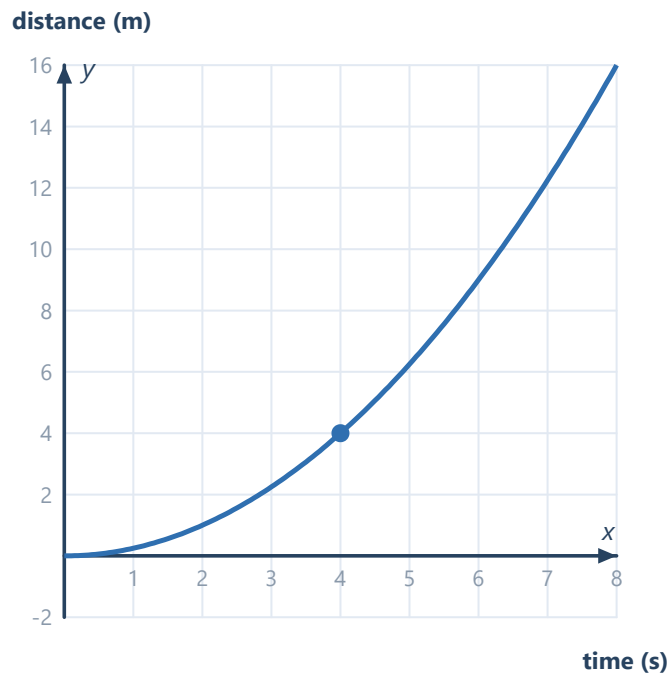


Answer: $y = \frac{5x}{12} + \frac{169}{12}$

- 10** Show that the line $3x + 4y = 25$ is a tangent to the circle $x^2 + y^2 = 25$. [4 marks]

Answer: Only one solution, so it is a tangent

- 11** The graph shows the distance travelled by a cyclist, s metres, after t seconds. Draw a tangent at $t = 4$ and use it to estimate the speed of the cyclist after 4 seconds. Give the units of your answer. [3 marks]



Answer: about 2 m/s

- 12** The speed of a particle is $v = 16 - t^2$ m/s for $0 \leq t \leq 4$. Use 4 strips of equal width to estimate the distance travelled in the 4 seconds. Is your answer an under-estimate or an over-estimate? Give a reason. [4 marks]

Answer: 42 m, an under-estimate

- 13** (a) Show that $x^3 + 4x - 3 = 0$ has a solution between 0 and 1. (b) Use the iteration formula $x_{n+1} = 3 \div (x_n^2 + 4)$ with $x_0 = 1$ to find the solution correct to 3 decimal places. Show that your answer is correct to 3 decimal

places.

[6 marks]

- (a) Show there is a solution between 0 and 1.

Answer: Change of sign: $f(0) = -3$, $f(1) = 2$

- (b) Find the solution to 3 d.p.

Answer: 0.674

- 14 A population of 2000 insects grows by 5% each day. Show that it takes 15 days for the population to double (reach at least 4000). [4 marks]

Answer: 15 days

- 15 $f(x) = x + 5$ and $g(x) = 3x - 2$. Find $(fg)^{-1}(x)$ and show that it is the same as $g^{-1}f^{-1}(x)$. [5 marks]

Answer: $(fg)^{-1}(x) = \frac{x-3}{3}$