



7.8D Trigonometric and Exponential Graphs: Fluency and Exam Drill

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write down the amplitude and the period (in degrees) of $y = 3 \sin(2x)$.

(Total for Question 1 is 2 marks)

- 2** Write down the amplitude and the vertical shift of $y = -2 \cos(0.5x) + 1$.

(Total for Question 2 is 2 marks)

- 3** State the exact values of $y = \sin x$ for $x = 0, 90, 180, 270$ and 360 degrees.

(Total for Question 3 is 5 marks)

- 4** For $y = \sin(x - 30) + 2$, find the x -coordinate of the first maximum after $x = 0$ (in degrees) and the value of that maximum.

(Total for Question 4 is 2 marks)

5 Write down the amplitude and period (in degrees) of $y = 4 \sin(3x)$.

(Total for Question 5 is 2 marks)

6 Evaluate the exponential function $y = 2^x$ at $x = 0$, $x = 1$ and $x = -1$.

(Total for Question 6 is 3 marks)

7 The graph of $y = 5(0.5)^x$ is sketched. State the horizontal asymptote and find the y-intercept.

(Total for Question 7 is 2 marks)

8 Solve $2^x = 8$.

(Total for Question 8 is 2 marks)

9 For $y = -\sin(x + 45) - 1$, state the amplitude, period, phase shift (direction and degrees) and vertical shift.

(Total for Question 9 is 4 marks)

10 Solve $\sin x = 0.5$ for $0 \leq x < 360$ degrees. Give your answers in degrees.

(Total for Question 10 is 2 marks)

11 Find the smallest positive solution (in degrees, 1 decimal place) of $3 \cos x = 1$.

(Total for Question 11 is 2 marks)

12 The graph of $y = 2 \sin(0.5x) + 1$ is considered for $0 \leq x \leq 720$ degrees.

(a) State the amplitude.

(b) State the period (in degrees).

(c) State the equation of the midline.

(d) Find all x in $0 \leq x \leq 720$ for which $y = 3$.

(a) State the amplitude.

(1)

(b) State the period (in degrees).

(1)

(c) State the equation of the midline.

(1)

(d) Find all x in $0 \leq x \leq 720$ for which $y = 3$.

(2)

(Total for Question 12 is 5 marks)

13 Solve $2^x = 4 \sin x$ for $0 \leq x \leq 360$ degrees. Explain your reasoning.

(Total for Question 13 is 3 marks)

- 14** The graph of $y = a^x$ passes through the points (0, 1) and (2, 18). Find the value of a . Give your answer in exact form and to 3 significant figures.

(Total for Question 14 is 2 marks)

Mark scheme · 7.8D Trigonometric and Exponential Graphs: Fluency and Exam Drill

Question 1

- **B1** amplitude = 3 cao
- **B1** period = $360/2 = 180$ degrees cao
- **Answer: Amplitude = 3; period = 180 degrees.**

Question 2

- **B1** amplitude = 2 cao (ignore sign)
- **B1** vertical shift = +1 cao
- **Answer: Amplitude = 2; vertical shift = +1.**

Question 3

- **B1** $\sin 0 = 0$ cao
- **B1** $\sin 90 = 1$ cao
- **B1** $\sin 180 = 0$ cao
- **B1** $\sin 270 = -1$ cao
- **B1** $\sin 360 = 0$ cao
- **Answer: $\sin 0 = 0$; $\sin 90 = 1$; $\sin 180 = 0$; $\sin 270 = -1$; $\sin 360 = 0$.**

Question 4

- **B1** x-coordinate = 120 degrees cao (since sin has max at 90 and phase shift +30)
- **B1** maximum value = 3 cao ($1 + 2$)
- **Answer: First maximum at $x = 120$ degrees; maximum value = 3.**

Question 5

- **B1** amplitude = 4 cao
- **B1** period = $360/3 = 120$ degrees cao
- **Answer: Amplitude = 4; period = 120 degrees.**

Question 6

- **B1** $2^0 = 1$ cao
- **B1** $2^1 = 2$ cao
- **B1** $2^{-1} = 1/2$ cao
- **Answer: At $x=0$: 1; $x=1$: 2; $x=-1$: $1/2$.**

Question 7

- **B1** horizontal asymptote $y = 0$ cao
- **B1** y-intercept = 5 cao (when $x = 0$)
- **Answer: Horizontal asymptote $y = 0$; y-intercept = 5.**

Question 8

- **M1** use $8 = 2^3$ or use logs (recognise powers)
- **A1** $x = 3$ cao
- **Answer: 3**

Question 9

- **B1** amplitude = 1 cao
- **B1** period = 360 degrees cao
- **B1** phase shift = 45 degrees left (because $x + 45$) cao
- **B1** vertical shift = -1 cao
- **Answer: Amplitude 1, period 360 degrees, phase shift 45 degrees left, vertical shift -1.**

Question 10

- **B1** $x = 30$ degrees cao
- **B1** $x = 150$ degrees cao
- **Answer: $x = 30$ degrees or $x = 150$ degrees.**

Question 11

- **M1** use $\cos x = 1/3$ and take arccos
- **A1** $x = \arccos(1/3) = 70.5$ degrees awrt
- **Answer: 70.5 degrees (to 1 dp).**

Question 12

- (a) **B1** amplitude = 2 cao
- (a) **Answer: 2**
- (b) **B1** period = $360/0.5 = 720$ degrees cao
- (b) **Answer: 720 degrees**
- (c) **B1** midline $y = 1$ cao
- (c) **Answer: $y = 1$**
- (d) **M1** set $2 \sin(0.5x) + 1 = 3$ so $\sin(0.5x) = 1$ and solve $0.5x = 90 + 360k$
- (d) **A1** $x = 180$ degrees (only solution in $0 \leq x \leq 720$) cao
- (d) **Answer: $x = 180$ degrees**

Question 13

- **M1** compare ranges: $4 \sin x$ lies between -4 and 4, $2^x > 0$ and $2^x > 4$ for $x > 2$
- **M1** for $0 \leq x \leq 2$ degrees, $4 \sin x \leq 4 \sin 2^\circ < 1$ while $2^x \geq 1$, showing $2^x > 4 \sin x$
- **A1** conclude there are no solutions in $0 \leq x \leq 360$ degrees cao
- **Answer: No solutions in $0 \leq x \leq 360$ degrees.**

Question 14

- **M1** use $a^2 = 18$ from point (2,18) (and $a^0 = 1$ checks)
- **A1** $a = \sqrt{18} = 3\sqrt{2} = 4.24$ to 3 s.f. cao
- **Answer: $a = \sqrt{18} = 3\sqrt{2}$ approx 4.24 (3 s.f.).**