

# Diagnostic Test — University of Durham

This is a multiple-choice test and is designed to take fifty minutes. Fill in your surname, forename, college and student ID below. Write the answer to each question (either a, b, c, d or e) in the appropriate box on the front cover. When you complete the test tear off the front cover and hand it in. Keep the remaining part with your work for your record and future reference.

Surname	
Forename	
College	
Student ID	

Qu.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.														



1. The product of seven integers is negative. This must imply that
  - (a) all of the numbers are negative
  - (b) one is negative and the others are positive
  - (c) three are negative and the others are positive
  - (d) five are negative and the others are positive
  - (e) none of the above answers is always correct
2. The solution of the equation  $\log_2(\log_3 x) = 3$  is
  - (a)  $x = 3$
  - (b)  $x = 3^4$
  - (c)  $x = 3^6$
  - (d)  $x = 3^8$
  - (e) none of the above answers is correct
3. The equation  $\sin(2x) = 2 \sin x$  holds
  - (a) for each  $x$
  - (b) only for  $x = 2k\pi$  with  $k$  an arbitrary integer
  - (c) only for  $x = k\pi$  with  $k$  an arbitrary integer
  - (d) for no value of  $x$
  - (e) none of the above answers is correct
4. The inequality  $\frac{x^2 - 1}{x} > 0$  holds
  - (a) for each  $x \neq 0$
  - (b) only for  $x > 1$
  - (c) only for  $x < -1$
  - (d) only for  $x < -1$  and for  $x > 1$
  - (e) none of the above answers is correct
5. A triangle ABC has the angles in B and C of  $30^\circ$  and two sides of 40 cm. Relative to the side BC the height is equal to
  - (a)  $10\sqrt{3}$  cm
  - (b) 20 cm
  - (c)  $20\sqrt{3}/3$  cm
  - (d) 80 cm
  - (e) none of the above answers is correct

6. The coordinates and nature of the turning points on  $y = 36x - 3x^2 - 2x^3$  are

- (a)  $(-2, -68)$  is a minimum and  $(3, 27)$  is a maximum
- (b)  $(2, 44)$  is a minimum and  $(-3, -81)$  is a maximum
- (c)  $(2, 44)$  is a maximum and  $(-3, -81)$  is a minimum
- (d)  $(-2, -68)$  is a maximum and  $(3, 27)$  is a minimum
- (e) none of the above answers is correct

7. Using integration by parts, the integral  $\int_0^\pi x \sin x \, dx$  is

- (a)  $\frac{1}{2} \sin(\pi^2)$
- (b)  $-2$
- (c)  $-\pi$
- (d)  $0$
- (e) none of the above answers is correct

8. The phrase “it is not true that all students are diligent” is equivalent to the phrase

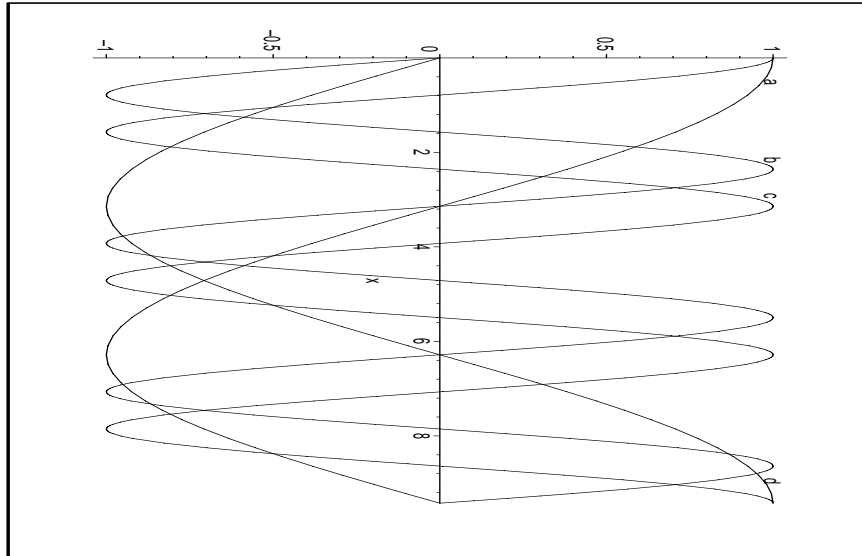
- (a) all students are not diligent
- (b) at least one student is not diligent
- (c) no student is diligent
- (d) at least one student is diligent
- (e) none of the above answers is correct

9. The number  $\sqrt{0.9}$  is equal to

- (a)  $0.3$
- (b)  $0.81$
- (c) a number between  $0.81$  and  $0.9$
- (d) a number between  $0.9$  and  $1$
- (e) none of the above answers is correct

10. Which of the following graphs

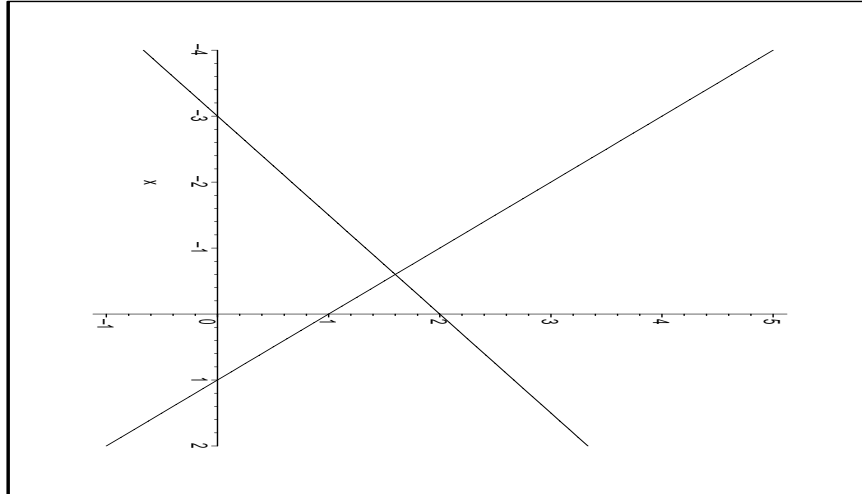
- (a) (b) (c) (d) (e) none of them  
are that of the function  $\sin(2x + \pi/2)$ ?



11. The following fractions  $\frac{3}{7} + \frac{1}{8}$  and  $\frac{1}{\sqrt{3}-1} + \frac{1}{\sqrt{3}+1}$  are equal to

- (a)  $4/5$  and  $\frac{1}{3}\sqrt{3}$  respectively  
 (b)  $31/56$  and  $\frac{1}{3}\sqrt{3}$  respectively  
 (c)  $4/5$  and  $\sqrt{3}$  respectively  
 (d)  $31/56$  and  $\sqrt{3}$  respectively  
 (e) none of the above answers is correct

12. The two lines in the graph



meet at

- (a)  $x = -1$  and  $y = 2$
- (b)  $x = -2/3$  and  $y = 5/3$
- (c)  $x = -3/5$  and  $y = 8/5$
- (d)  $x = -11/20$  and  $y = 31/20$
- (e) none of the above answers is correct

13. The derivative of  $(1 - x^2) \ln(1 - x^2)$  with respect to  $x$  is

- (a)  $-2x + 2x \ln(1 - x^2)$
- (b)  $2x - 2x \ln(1 - x^2)$
- (c)  $-2x + 2x^2 \ln(1 - x^2)$
- (d)  $1 - 2x \ln(1 - x^2)$
- (e) none of the above answers is correct

14. The integral  $\int_{-2/3}^{-1/3} (3x + 2)^n dx$  ( $n > 1$ ) is

- (a)  $\frac{1}{n+1}$
- (b)  $\frac{3}{n}$
- (c)  $\frac{1}{3(n-1)}$
- (d)  $\frac{1}{3(n+1)}$
- (e) none of the above answers is correct