123. MATHS METHODS for JF NATURAL SCIENCES.

CHRISTMAS EXAM

Wednesday, December 6

12.05-12.55

You may not leave early.

Conor Houghton

ALL QUESTIONS TO BE ATTEMPTED

Please write your name and student number below. The exam is multiple choice, answer each of the questions by clearly circling which one of the five possible answers: A, B, C, D or E, you think is correct. Do not mark more than one answer to each question. If you make a mistake, cross out your answer clearly and write your new answer immediately to the left of the question number. Any further mistakes should be corrected by crossing out the answer you now think is wrong and writing your new answer to the left of the old one. **Do not write anything else on these sheets, there is rough paper provided for your calculations.** No marks will be deducted for an incorrect answer.

NAME:

NUMBER:

1. Find (x, y) by solving the simultaneous equation $6x - 2y = -6$ and $-5x + 3y = 17$.

A. (3,-9) B. (-3,9) C. (-2,8) D. (2,9) E. (2,8)

2. Rewrite

$$\frac{1}{x^2 - 5x - 14}$$

using partial fractions.

A. $\frac{1}{5(x+7)} + \frac{1}{5(x-2)}$ B. $\frac{1}{9(x-7)} - \frac{1}{9(x+2)}$ C. $\frac{1}{9(x+7)} - \frac{1}{9(x+2)}$

D. $\frac{1}{5(x-7)} - \frac{1}{5(x-2)}$ E. $\frac{1}{9(x-7)} + \frac{1}{9(x+2)}$

3. What is the x^3 term in the binomial expansion of $(2 - 4x)^8$?

A. $114688x^3$ B. $-114688x^3$ C. $-458752x^3$ D. $153788x^3$ E. $458752x^3$

4. At one stage the Lotto had 36 numbers and 6 were drawn. It was changed because someone tried to buy all the numbers. The tickets cost 50p each, all possible Lotto combinations would have cost

A. £618,311 B. £1,947,792 C. £94,143,280 D. £1,236,622 E. £973,896

5. What is the period of $\sin^3 3x$?

A. $\frac{4\pi}{3}$ B. $\frac{\pi}{3}$ C. $\frac{2\pi}{3}$ D. $\frac{3\pi}{4}$ E. $\frac{3\pi}{2}$

6. What is $\sin 3x$?

A. $3\sin x \cos^2 x - \sin^3 x$ B. $3\sin x \cos^2 x - \sin^2 x \cos x$ C. $2\sin x \cos x$

D. $2\sin^2 x \cos x$ E. $3\cos x \sin^2 x - \cos^3 x$

7. Which is closest to $\log_5 6$?

A. 1.7918 B. 1.6094 C. 0.6990 D. 1.11328 E. 0.5439

8. A population doubles every five hours, if you begin with a population of 1000, after 24 hours the population will be approximately

A. $0.1304\,10^{56}$ B. 27858 C. $.9823\,10^{43}$ D. 0.2479 E. 0.1486

9. If

$$f(x) = \frac{x^2}{x+1} + xe^{x-1} - \log x^2$$

then what is $f'(1)$?

A. $-\frac{5}{4}$ B. $-\frac{3}{4}$ C. $\frac{5}{4}$ D. $\frac{3}{2}$ E. $\frac{3}{4}$

10. $y = \log \tan x$ then what is

$$\frac{dy}{dx}$$

is?

A. $\dfrac{1-\tan x}{\tan x}$ B. $-\sin x \log x$ C. $\dfrac{\log x}{\tan x}$

D. $\dfrac{1}{\cos^2 x \, \tan x}$ E. $\dfrac{1-\tan^2 x}{\tan x}$

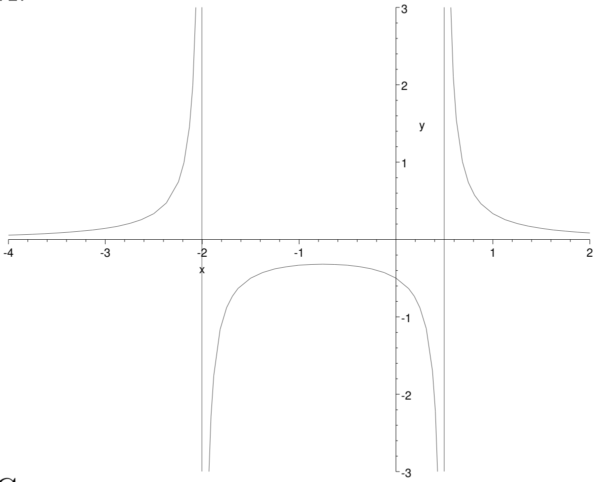
11. $y = 2x^3 - 9x^2 + 12x - 9$ has a minimum at

A. 1 B. 2 C. 3 D. 4 E. 5

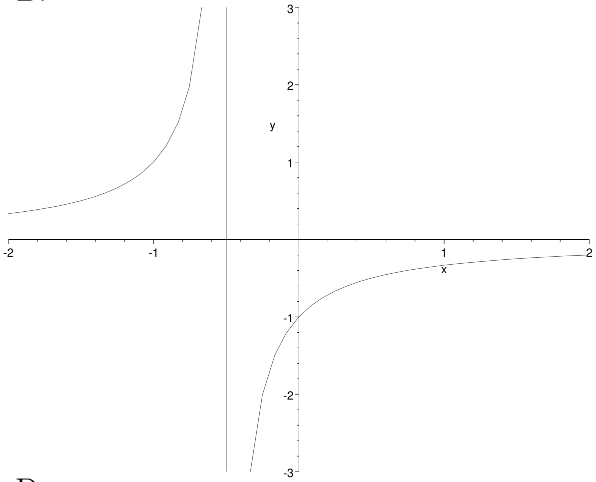
12. Which is the graph of

$$y = \frac{1}{2 + 3x - 2x^2}$$

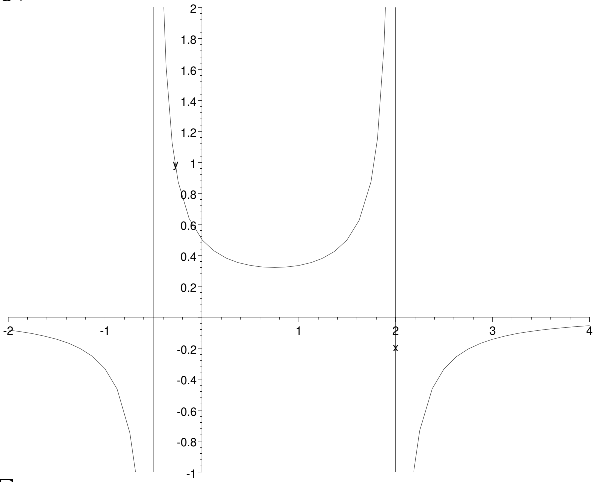
A.



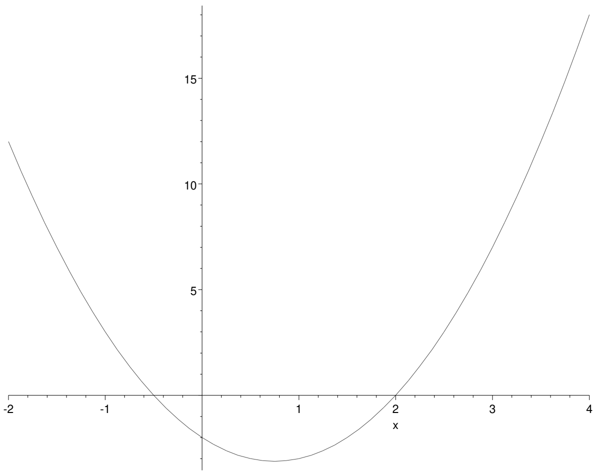
B.



C.



D.



E.