RIGOUR

by cdmasterworks Ltd

Numeracy for Learning, Life and Work

May Higher Maths Calendar

#abitofmathseveryday

1 Differentiate the following;

$cos^5 x$

2 Calculate the inverse function, $h^{-1}(x)$, for;

$h(x) = 9x + 4.$

3 If A is an acute angle with $\cos A = \frac{1}{2}$ find the exact value of sin2A.

4 Calculate the size of the angle that the line $y = 1 - \sqrt{3}x$ makes with the positive direction of the x-axis.

5 Write $y = -2x^2 + 8x + 3$ in the form $y = a(x + b)^2 + c.$

6 Simplify the following logarithmic expression;

$2\log_5 10 - \log_5 500$

7 The line through (-7, y) and (3, 1) has a gradient of $\frac{1}{2}$. What is the value of y?

8 A curve for which $\frac{dy}{dx} = 12x^2 - 6$ passes through the point (-2, 0). Express y in terms of x.

9 Calculate the size of the angle between the vectors $\underline{u} = \begin{pmatrix} 9 \\ 6 \\ 1 \end{pmatrix}$ and $\underline{v} = \begin{pmatrix} 2 \\ 0 \\ -5 \end{pmatrix}$

10 State the equation of the graph of the inverse function for $y = \log_5 x$.

11 The quadratic equation $5x^2 - 4x + k = 0$ has real roots. What are the range values of k?

12 Differentiate with respect to $f(x) = \frac{x^3 - 2}{\sqrt{x}}.$

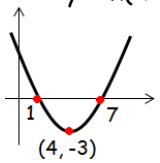
13 Find the point of intersection between the lines $y = 2 - 3x$ and $y = x + 1$

14 Solve the equation $\sin 2x = \sqrt{3}\cos x$ for $0 \leq x \leq 2\pi$

15 Find the centre and radius for the circle

$x^2 + y^2 - 10x + 6y - 4 = 0.$

16 For the equation $y = k(x + a)(x + b)$, what are the values of a, b and k?

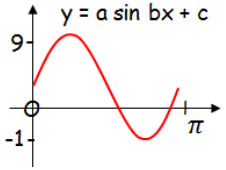


17 Find the limit of the recurrence relation

$u_{n+1} = 0{\cdot}3u_n + 7.$

18 Show that $(x + 1)$ is a factor of $x^3 + 6x^2 - 31x - 36$ and hence factorise it fully.

19 What are the values of a, b and c?



20 Find the equation of the tangent to the curve $y = 5x^2 + 9$ where $x = -1.$

21 Solve the quadratic inequality

$6 - x - x^2 < 0$

22 Express $\sqrt{3}\cos x + \sin x$ in the form $k\sin(x + a)$ where $k > 0$ and $0 < a < 2\pi.$

23 The position u has components... $\begin{pmatrix} 9 \\ 0 \\ 12 \end{pmatrix}$

Find the components of a unit vector which is parallel to u.

24 Show that L(-1, 0, 1), M(5, 3, 10) and N(13, 7, 22) are collinear and find the ratio in which M divides LN.

25 A recurrence relation is defined as $u_{n+1} = 2u_n - 7$. If $u_5 = 11$, calculate u_3.

26 State any restrictions on the domain for the function;

$f(x) = \frac{2x + 1}{x^2 - 2x - 8}$

27 Show that the line y = 2x + 5 is a tangent to the circle $x^2 + y^2 = 5$ and find the coordinates of the point of contact.

28 Solve the following exponential equation...

$2^x = 5 \cdot 3$

29 Calculate the coordinates of the stationary points on the curve $y = x^3 - 6x^2$ & determine nature.

30 Triangle PQR has vertices P(1, 2), Q(3, 12) and R(11, 4). Calculate the equation of the median from Q.

31 Calculate the shaded area...