RIGOUR

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Numeracy for Learning, Life and Work

November Higher Maths Calendar

#abitofmathseveryday

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

$h(x) = x^3 - 8.$

2 Show that the line y = 4x - 3 is a tangent to the curve $y = x^2 - 2x + 6$ and find the point of contact.

3 Find the centre and radius for the circle

$x^2 + (y-4)^2 = 121$

4 Write

$y = -2x^2 + 12x + 7$

in the form;

$y = a(x+b)^2 + c.$

5 State the equation of the graph of the inverse function for $y = 25^{\frac{1}{2}x}$.

6 Find the equation of the tangent to the curve $y = 3x^2 + 8x$ where $x = -2$.

7 Solve the equation cos2x = cosx - 1 for $0 \leq x \leq 2\pi$

8 Triangle ABC has vertices A(5, 4), B(3, -1) and C(9, 1). Calculate the equation of the altitude from A.

9 State why a limit exists and find the limit of the recurrence relation

$u_{n+1} = 0 \cdot 2u_n - 40.$

10 For the function

$f(x) = \frac{\sqrt{x} + 9}{x}$,

find $f'(4)$.

11 A curve for which $f'(x) = 3x^2 + 8$ passes through the point (1, -7).

Find $f(x)$.

12 Express $\sqrt{3}cosx° - sinx°$ in the form $kcos(x-a)°$ where $k > 0$ and $0 < a < 360$.

13 Differentiate the following;

$(5x-2)^8$

14 Factorise the following polynomial

$f(x) = x^3 - 21x - 20$

15 Solve the quadratic inequality

$18 - 3x - x^2 < 0$

16 The vectors

$\underline{u} = \begin{pmatrix} k \\ -3 \\ 4 \end{pmatrix}$ and $\underline{v} = \begin{pmatrix} 0 \\ 8 \\ k \end{pmatrix}$

are perpendicular.

What is the value of k?

17 Solve the following equation

$\log_4(2x-1) = 2 - 3\log_4 2$

18 Calculate the length of the line joining $(-2, -1)$ and $(6, 5)$.

19 A recurrence relation is defined as $u_{n+1} = \frac{3}{8}u_n + 4$. If $u_5 = 32$, calculate u_7.

20 Find the equation of the tangent at the point (4, -6) on the circle

$x^2 + y^2 - 28x + 16y - 2 = 0$

21 Show that R(-1, 0, -7), S(2, 6, 2) and T(6, 14, 14) are collinear and find the ratio in which S divides RT.

22 Find the equation of the line which is perpendicular to the line with equation $2y - 8x = 7$ passing through (-12, 5).

23 State any restrictions on the domain for the function;

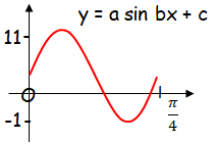
$g(x) = \sqrt{9 - 4x}$

24 Calculate the coordinates of the stationary points on the curve $y = x^3 - 12x + 10$ & determine nature.

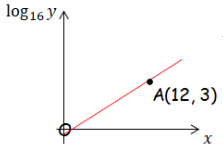
25 If A is an acute angle with $sinA = \frac{4}{\sqrt{7}}$ find the exact value of $cos2A$.

26 Calculate the gradient of a straight line which makes an angle of 135° with the positive direction of the x-axis.

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

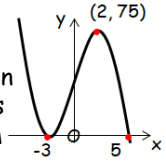


28 Two variables, x and y, are connected by the law $y = a^x$.



Find the value of a.

29 The equation this cubic is of the form



$y = k(x+a)^2(x+b)$.

What is it's equation?

30 The curve $y = x^3 - 3x^2 - 6x + 8$ intersects the x-axis at points (-2, 0) (1, 0) and (4, 0).

Calculate the shaded area.