RIGOUR

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Numeracy for Learning, Life and Work

June Higher Maths Calendar

#abitofmathseveryday

1 Calculate the length of the line joining $(-2,-4)$ and $(10,1)$.

2 Differentiate the following;

$(3x-1)^{10}$

3 Solve the quadratic inequality

$x^2 - 4x - 12 < 0$

4 A recurrence relation is defined as $u_{n+1} = \frac{3}{4}u_n + 10$. If $u_5 = 24$, calculate u_7.

5 Factorise the following polynomial

$f(x) = x^3 - 7x - 6$

6 The vectors $\underline{u} = \begin{pmatrix} k \\ -3 \\ 9 \end{pmatrix}$ and $\underline{v} = \begin{pmatrix} 0 \\ 12 \\ k \end{pmatrix}$ are perpendicular.

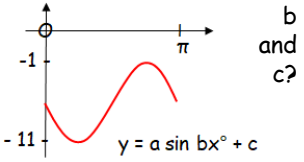
What is the value of k?

7 Find the equation of the line which is perpendicular to the line with equation $3y - 6x = 5$ passing through (-8, 3).

8 Find the equation of the tangent at the point (6, -2) on the circle

$x^2 + y^2 + 6x - 2y - 2 = 0$

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



10 Show that the line $y = x - 5$ does not intersect the parabola with equation $y = x^2 - 3x + 2$.

11 Show that A(-2, 0, -4), B(1, 3, 2) and C(8, 10, 16) are collinear and find the ratio in which B divides AC.

12 State any restrictions on the domain for the function;

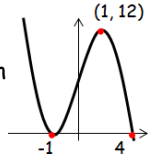
$h(x) = \sqrt{2 - 5x}$

13 Calculate the coordinates of the stationary points on the curve $y = x^3 + 3x^2 - 9x + 7$ & determine nature.

14 Triangle ABC has vertices A(-2, 7), B(4, 1) and C(12, 5). Calculate the equation of the altitude from A.

15 If A is an acute angle with $\sin x = \frac{1}{\sqrt{5}}$ find the exact value of cos2x.

16 The equation this cubic is of the form



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

What is it's equation?

17 Calculate the gradient of a straight line which makes an angle of 150° with the positive direction of the x-axis.

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

$u_{n+1} = 0 \cdot 3\, u_n - 14$.

19 State the equation of the graph of the inverse function for $y = 9^x$.

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

$f(x) = x^2 + 5$.

21 For the function

$f(x) = \frac{\sqrt{x} + 5}{x}$,

find $f'(9)$.

22 Find the equation of the tangent to the curve $y = 2x^2 + 5x$ where $x = -3$.

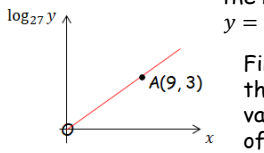
23 A curve for which $f'(x) = 6x^2 + 1$ passes through the point (2, -9).

Find $f(x)$.

24 Find the centre and radius for the circle

$(x + 2)^2 + y^2 = 49$

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



Find the value of a.

26 Write $y = -5x^2 + 10x + 3$ in the form;

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

27 Express $\cos x° - \sin x°$ in the form $k\cos(x - a)°$ where $k > 0$ and $0 < a < 360$.

28 Solve the following equation

$\log_2(6x + 1) = 5 - 3\log_2 2$

29 Solve the equation $\cos 2x = 4\sin x - 5$ for $0 \leq x \leq 2\pi$

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

Calculate the shaded area.