NAME   : _____(   )   CLASS : _____

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1) The path of a water jet can be modelled by the quadratic function

$$y = C(x - 1.2)^2 + 2.25$$

where x m is the horizontal distance it travels, y m is the height of the water above the ground and C is a constant. The initial height of the water jet is 1.05 m above the ground.

i) Find the value of C.   [2]

ii) Find the maximum height above the ground that the water jet reaches.   [1]

iii) Find the value of x for which the water jet is 1.05 m above the ground again.   [2]

iv) Find the maximum horizontal distance travelled by the water jet.   [2]

2) Prove that $2x^2 - 5x + 24 > 0$ for all real values of x. Hence, find the range of values of x for which $\dfrac{3x^2 - 16x + 5}{2x^2 - 5x + 24} < 0$. [6]

3) Express $\dfrac{2x^3 + 6x^2 + 1}{(x-1)(x+2)^2}$ in partial fractions. [5]

4) The polynomial $f(x) = 3x^3 + ax^2 + bx + 1$, where a and b are constants, is such that it is divisible by $x + 1$ and leaves a remainder of 27 when divided by $x - 2$.

a) Show that $a = 1$ and $b = -1$. [4]

b) Explain why the equation $f(x) = 0$ has only 1 real root and state its value. [4]

5) Factorise $3x^3 - 24y^3$ completely. [2]

End of paper