<u>Year 4 Math Assignment 10: Differentiation</u> **Time: 45 mins**

Q1 Find the derivative of the following using first principles

(a) $y = 5x - 4$ (b) $y = x^2 + 6$ (c) $y = 2x - \frac{1}{x}$

Q2 Differentiate the following with respect to x

(a) $\frac{6x^3 - 2x^2 + 9}{5x^2}$ (b) $(2 - 3x^3)^4$

(c) $(1 + \sqrt[3]{x})(1 - \sqrt[3]{x})$ (d) $\frac{(3x-5)(x+1)}{x^2}$

(e) $4x^3(\sqrt{x} - 1)$ (f) $\sqrt{x^2 + 3x + 2}$

(g) $\frac{x-4}{2(x-2)^{\frac{3}{2}}}$ (h) $4\sqrt[3]{x} + \frac{7}{\sqrt{x}} - 5x^2$

(i) $\left(\frac{x^2+3}{x^2}\right)\left(2x^6 + 1\right)x$ (j) $\left(x + \frac{1}{x}\right)\sqrt{x+1}$

(k) $\sqrt{x}\left(x^2 + 1\right)^2$ (l) $(x^3 + 2)\left[(2x+1)^2 + 1\right]^3$

(m) $y(x+2) = x + 1$ (n) $y(x+2) - \left(x^2 - 1\right) = 0$

Q3 Calculate the x-coordinates of the points on the curve $y = \sqrt{\frac{1-x}{x^2+3}}$ for which $\frac{dy}{dx} = 0$.

Q4 Given that $A = 4r^3 - 3r^2 - 18r + 5$, find $\frac{dA}{dr}$ and the range of values of r for which $\frac{dA}{dr} < 0$.

Q5 Find the coordinates of the points where the tangent is horizontal for the given curve of $y = (2x-3)^4(x-4)^5$.

Q6 A function is defined by $f(x) = (x+k)(kx+1)^3$, where k is a constant.
(a) If $f'(1) = 0$, find the values of k.
(b) In addition, if k is an integer, find the value of $f'(2)$.