Year 12 Extension 1 **Methods of Approximation Assignment** **Date Due:**

1. (a) Show that $f(x) = x^3 - 3x^2 - 9x + 1$ has a root between $x = 4$ and $x = 5$.
   (b) If $P(x) = 3x^4 + 4x^3 - 12x^2 - 1$, show that a root lies in the interval $-3 < x < -2$.
2. Show that there is no root between $x = 0$ and $x = 1$ on the curve $f(x) = 2x^3 - 3x^2 + x + 1$.
3. (a) Show that $P(x) = 4x^3 + 15x^2 - 21x - 5$ has a root between $x = 1$ and $x = 2$
   (b) By halving the interval twice, show that $P(x)$ has a zero of 1.25.
4. (a) Show that $f(x) = x^2 + x - 3$ has a root between $x = 1$ and $x = 2$.
   (b) By halving the interval once, show that the root lies in the interval $1 < x < 1.5$.
5. The polynomial equation $2x^2 - x - 9 = 0$ has a root near $x = 2.5$. Find an approximation to the root, correct to 2 decimal places, by using 1 application of Newton's method.
6. $P(x) = 4x^3 - x^2 + x - 2$ has a root near $x = 0.6$. Use 2 applications of Newton's method to find an approximation to the root, correct to 3 decimal places.
7. (a) Show that the equation $x^3 - 2x^2 + x + 5 = 0$ has a root between $x = -2$ and $x = -1$.
   (b) Use the method of halving the interval twice to find an approximation to this root of the equation.
   (c) Use Newton's method once to find an approximation to this root of the equation, correct to 2 decimal places, starting with $x = -1.5$.
   (d) Which method gives a better approximation of the root?
8. The curve $y = (2x - 3)^5 - x$ has a root between $x = 2$ and $x = 3$. Use Newton's method with 1 application to find an approximation to the root, correct to 2 decimal places. Is this a good approximation?