SPTA
Higher Homework
Mixed 3 Polynomials, Differentiation & Quadratics

1. A function f is defined on the set of real numbers by $f(x) = x^3 - 3x + 2$.

(a) Find the coordinates of the stationary points on the curve $y = f(x)$ and determine their nature. **(6)**

(b) (i) Show that $(x - 1)$ is a factor of $x^3 - 3x + 2$
(ii) Hence or otherwise factorise $x^3 - 3x + 2$ fully. **(4)**

(c) State the coordinates of the points where the curve with equation $y = f(x)$ meets both the axes and hence sketch the curve. **(4)**

2. Functions f and g are given by $f(x) = 3x + 1$ and $g(x) = x^2 - 2$.

(a) (i) Find $p(x)$ where $p(x) = f(g(x))$.
(ii) Find $q(x)$ where $q(x) = g(f(x))$. **(3)**

(b) Solve $p'(x) = q'(x)$. **(3)**

3. Find the range of values of k such that the equation $kx^2 - x - 1 = 0$ has no real roots. **(4)**