Differentiation Test II

1. Differentiate with respect to x the following:
   (a) $x^{100} - 7x^4 + 2$. $\boxed{100x^{99} - 7}$
   (b) $x^2 + \frac{1}{x}$. ☐
   (c) $3\sqrt{x} + 7x$. ☐
   (d) $\frac{1}{2x^2}$. ☐
   (e) $\frac{2x^3-1}{x^2}$. ☐
2. Find the equation of the tangent to $y = x^3 + x^2 - 2x + 1$ when $x = -1$. ☐
3. (a) Find the coordinates of the stationary point(s) on $y = x^3 - 3x^2 - 9x + 2$. ☐
   (b) Find $\frac{d^2y}{dx^2}$. ☐
   (c) Use your second derivative to determine the nature of the stationary points on the curve in part (a). ☐
4. (a) Find the points of intersection of $y = 4 - x^2$ and $y = 3x$. [Draw a very rough sketch of the curve and the line to verify your answer.] ☐
   (b) Find the equations of the tangents to $y = 4 - x^2$ at the points of intersection. ☐
   (c) The tangents intersect at P. Find the coordinates of P. ☐
5. Find the coordinates of where the normal to $y = x^2 + 2x - 3$ when $x = \frac{1}{2}$ crosses the x-axis. ☐
6. Find the coordinate of the point on $y = x^2 - 2x + 3$ where the tangent is parallel to $y + 2x = 7$. ☐