Problem Sheet 3

1. What are the derivatives of the following:

a) $y = 3x + 1$ b) $y = x^2 + 2x - 3$ c) $y = \dfrac{2x-1}{2x+1}$

d) $y = \sqrt{2x^2 + 1}$ e) $y = (x-1)(x+1)^2$ f) $\sqrt{(x+1)(x-1)}$

2. a) Give the equations of the tangents to $y = -x^2 + 5x - 6$ at the points where it crosses the x-axis.

b) As (a) but normals not tangents.

3. Consider the curve $f(x) = (x-1)e^{x-x^2}$

a) What does $f(x)$ tend to as *x* tends to positive and to negative infinity?
b) Where are the critical points of f?
c) What type are they?
d) Sketch the curve.

4. As (3) but for $g(x) = \dfrac{x+1}{x^2+1}$

5. What are the first three derivatives of $y = (1 + x^2)^{-1}$

6. Find equations for all lines that go through $(-2, 2)$ and are tangent to $y = x^3 - x$