1. Differentiate the following with respect to $x$:

(a) $\ln(2x^4 + 1)$, \hspace{1cm} (b) $\ln(x + 2)^{3/4}$, \hspace{1cm} (c) $\tan(e^x)$,

(d) $x^4 \ln(3x)$, \hspace{1cm} (e) $e^{\sin x + \cos x}$, \hspace{1cm} (f) $\ln \arcsin x$,

(g) $e^{2x} \sin x$, \hspace{1cm} (h) $e^{4\ln x}$.

2. In each of the following cases, express $\frac{dy}{dx}$ in terms of $x$ and $y$:

(a) $xy - x + 2y = 1$, \hspace{1cm} (b) $x^2 + xy = y^3$, \hspace{1cm} (c) $x^2y^3 = 2x - y$.

3. Find the tangent to the curve $x^2 + xy + y^2 = 7$ at the point $(2, 1)$.

4. Find the tangent to the curve $x \ln y = x^2 - y^2$ at the point $(1, 1)$.

5. Solve the following quadratic equations, stating whether there are two, one or no (real) roots, and giving the answers exactly in terms of square roots.

(i) $x^2 + 2x - 2 = 0$ \hspace{1cm} (ii) $x^2 + 2x + 2 = 0$ \hspace{1cm} (iii) $x^2 - 2x + 1 = 0$.