PROBLEM SHEET 3

3.1 If $y = \ln(1 + x^2)$, find $\mathrm{d}y/\mathrm{d}x$.

3.2 If
$$y = \frac{x}{1 + x^2}$$
find $\mathrm{d}y/\mathrm{d}x$.

3.3 If $y = \cosh(x^4)$, find $\mathrm{d}y/\mathrm{d}x$.

3.4 If $y = x^2 \ln x$, find $\mathrm{d}^2y/\mathrm{d}x^2$.

3.5 Find $\mathrm{d}y/\mathrm{d}x$ for $y = (1 + x^2)^{-1/2}$.

3.6 Show that for $y = \sinh^{-1} x$,
$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{1}{\sqrt{1 + x^2}}.$$

3.7 Show that for $y = \ln[x + \sqrt{1 + x^2}]$,
$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{1}{\sqrt{1 + x^2}}.$$

3.8 Find $\mathrm{d}y/\mathrm{d}x$ for $y = \cos^{-1}(\sin x)$.

3.9 A curve is given in polar coordinates by $r = 1 + \sin^2\theta$. Find $\mathrm{d}y/\mathrm{d}x$ at $\theta = \pi/4$.

3.10 Show that if
$$y = \frac{1}{2a} \ln \left| \frac{x - a}{x + a} \right|, \quad \text{then} \quad \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{1}{x^2 - a^2}.$$