1. Differentiate the functions:
   (i). $f(x) = (4x - x^2)^{100}$
   (ii). $f(x) = \frac{1}{x^2+1}$
   (iii). $f(x) = \cos(x^3 + a^3)$, where a is a constant
   (iv). $f(x) = (x^2 + 1)^3(x^2 + 2)^4$
   (v). $f(x) = \sin(x \cos x)$
   (vi). $f(x) = \sin(\sin(\sin x))$
2. Find $\frac{dy}{dx}$ by implicit differentiation: $y \cos x = x^2 + y^2$
3. Use implicit differentiation to find an equation of the tangent line to the curve $x^2 + 2xy - y^2 + x = 2$ at $(1, 2)$.
4. Find y'' of $9x^2 + y^2 = 9$ by implicit differentiation.
5. Find the linearization $L(x)$ of $f(x) = \sin x$ at $x = \frac{\pi}{6}$
6. Find the differential of $y = x \cos x$
7. The radius of a circular disk is given as 24 cm with a maximum error in measurement of 0.2 cm. Use differentials to estimate the maximum error in the calculated area of the disk.