The Second Derivative

$$y'', f''(x), \frac{d^2}{dx^2}\{f(x)\}, \frac{d^2 y}{dx^2}$$

e.g. $(i)\ y = 3x^2 + x + 2$

$$\frac{dy}{dx} = 6x + 1$$

$$\frac{d^2 y}{dx^2} = 6$$

$(ii)\ y = \sqrt{x^2 + 3}$

$$= \left(x^2 + 3\right)^{\frac{1}{2}}$$

$$\frac{dy}{dx} = \frac{1}{2}\left(x^2 + 3\right)^{-\frac{1}{2}}(2x)$$

$$= x\left(x^2 + 3\right)^{-\frac{1}{2}}$$

$$\frac{d^2 y}{dx^2} = (x)\left[-\frac{1}{2}\left(x^2 + 3\right)^{-\frac{3}{2}}(2x)\right] + \left(x^2 + 3\right)^{-\frac{1}{2}}(1)$$

$$= -x^2\left(x^2 + 3\right)^{-\frac{3}{2}} + \left(x^2 + 3\right)^{-\frac{1}{2}}$$

$$= \left(x^2 + 3\right)^{-\frac{3}{2}}\left[-x^2 + x^2 + 3\right]$$

$$= \frac{3}{\left(x^2 + 3\right)\sqrt{x^2 + 3}}$$

Exercise 4D; 1 to 7 bdf etc in all, 8, 9b, 10b, 11, 13, 14ac, 15