10. If $y = 2^x$, write   (i) 2^{2x} (ii) 2^{2x+1} and   (iii) 2^{x+3} in terms of y.
Hence solve the equation $2^{2x+1} - 2^{x+3} - 2^x + 4 = 0$.

$$y = 2^x$$

$$2^{2x} = (2^x)^2 = y^2 \quad \bigg/ \quad 2^{2x+1} = (2^x)^2(2) = 2y^2$$

$$2^{x+3} = (2^x)(2^3) = 2^3 y = 8y$$

$$2y^2 - 8y - y + 4 = 0$$

$$2y^2 - 9y + 4 = 0$$

$$(2y - 1)(y - 4) = 0$$

$$2y - 1 = 0 \quad \bigg| \quad y = 4$$

$$y = \tfrac{1}{2}$$

$$y = \tfrac{1}{2} = 2^x = 2^{-1}$$

$$\Rightarrow x = -1$$

$$y = 4 = 2^x = 2^2$$

$$x = 2$$