- For the third problem ($x^2 + y^2 = z^n$) you can consider z odd and z even:

$$x^2 + y^2 = z^{2k+1} \qquad x^2 + y^2 = z^{2k}$$

- For z even we have

$$x^2 + y^2 = z^{2k} = \left(z^k\right)^2$$

This look like the case where n = 2.