(2) Find Pedal equation to curve $r = a(1+\sin\theta)$

(2) $r = a(1+\sin\theta)$

$$\frac{dr}{d\theta} = a\cos\theta$$

We have, $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$

$= \frac{1}{r^2} + \frac{1}{r^4}(a\cos\theta)^2$

$= \frac{1}{r^2} + \frac{1}{r^4}(a^2\cos^2\theta)$

$$\frac{1}{p^2} = \frac{1}{r^2} + \frac{a^2}{r^4}(1-\sin^2\theta) \quad -(1)$$

Given, $r = a(1+\sin\theta)$

$\frac{r}{a} = 1+\sin\theta$

$\sin\theta = \frac{r}{a} - 1 = \boxed{\frac{r-a}{a}} \quad -(2)$

Substituting (2) in (1) we get

$\frac{1}{p^2} = \frac{1}{r^2} + \frac{a^2}{r^4}\left[1 - \left(\frac{r-a}{a}\right)^2\right]$

$= \frac{1}{r^2} + \frac{a^2}{r^4}\left[1 - \frac{(r-a)^2}{a^2}\right]$

$= \frac{1}{r^2} + \frac{a^2}{r^4}\left[\frac{a^2 - [r^2+a^2-2ar]}{a^2}\right]$

$= \frac{1}{r^2} + \frac{a^2 + 2ar - a^2 - r^2}{r^4}$

$= \frac{1}{r^2} + \frac{2ar}{r^4} - \frac{r^2}{r^4}\frac{1}{r^2} = \frac{1}{r^2} + \frac{2ar}{r^4} - \frac{1}{r^2}$

$\frac{1}{p^2} = \frac{2a}{r^3}$

$$2ap^2 = r^3$$