$$f'(x) = \frac{2(x+k)(x+1)^2 - 2(x+1)(x+k)^2}{(x+1)^4}$$

$$= \frac{2(x+k)\cancel{(x+1)}\left[(x+1)-(x+k)\right]}{(x+1)^{\cancel{4}\,3}} = \frac{2(x+k)}{(x+1)^3}(\cancel{x}+1-\cancel{x}-k)$$

$$f'(x) = \frac{2(x+k)}{(x+1)^3}(1-k)$$

$f(x)=0$ $\quad x=-k \quad\quad Q=(-k;0) \quad\quad k \neq 1$

$$f'(-k) = \frac{2\overbrace{(-k+k)}^{=0}}{(-k+1)^3}(1-k) \quad\quad f'(-k)=0$$

$$f''(x) = 2(1-k)\left[\frac{(x+1)^3 - (x+k)3(x+1)^2}{(x+1)^6}\right]$$

$$f''(x) = 2(1-k)\left[\frac{x+1-3x-3k}{(x+1)^4}\right]$$

$$= 2(1-k)\left[\frac{1-3k-2x}{(x+1)^4}\right] = f''(x)$$

$$x = \frac{1-3k}{2}$$

$$x_F = \frac{1-3k}{2}$$

$$f\left(\frac{1-3k}{2}\right) = \frac{\left(\frac{1-3k}{2}+k\right)^2}{\left(\frac{1-3k}{2}+1\right)^2} = \frac{1}{9}$$

$$\frac{\left(\frac{1-3k+2k}{\cancel{2}}\right)^2}{\left(\frac{1-3k+2}{\cancel{2}}\right)^2} = \frac{1}{9} \qquad \frac{(1-k)^2}{(3\cancel{x}-3k)^2} = \frac{1}{9}$$

$$\frac{(1-k)^2}{\cancel{9}(3-k)^2} = \frac{1}{\cancel{9}} \qquad 1+\cancel{k^2}-2k = 9-6k+\cancel{k^2}$$

$$4k = 8 \qquad k = 2 \qquad x_F = -\frac{5}{2} \qquad y_F = \frac{1}{9}$$