8 (iv) $2^{3y+1} + 5(2^{2y}) = 18$

$2(2^{3y}) + 5(2^{2y}) - 18 = 0$

$2(2^{y})^3 + 5(2^{y})^2 - 18 = 0$

The above equation is comparable to the equation $2x^3 + 5x^2 - 18 = 0$ with $x = 2^y$

Therefore, $2^y = \frac{3}{2}$

$\ln 2^y = \ln \frac{3}{2}$

$y \ln 2 = \ln \frac{3}{2}$

$y = \frac{\ln 3/2}{\ln 2}$

$= 0.5849625007$

≈ 0.585

9 (i) When $k = 5$, $y = 2x^2 + 7x + 5$

At the points of intersection (if any) with the line $y = 19x - 13$,

$2x^2 + 7x + 5 = 19x - 13$

$2x^2 - 12x + 18 = 0$

$x^2 - 6x + 9 = 0$

$b^2 - 4ac = (-6)^2 - 4(1)(9)$

$= 36 - 36$

$= 0$

showing that the line is a tangent to the curve.

$(x-3)^2 = 0$

$x = 3$

$y = 19(3) - 13$

$= 44$

The coordinates of the point of contact is $(3, 44)$.

(ii) $y = 2x^2 + (k+2)x + k$

When y cannot be negative, the curve must lie on or above the x-axis.

$b^2 - 4ac \leq 0$

$(k+2)^2 - 4(2)(k) \leq 0$

$k^2 + 4k + 4 - 8k \leq 0$

$k^2 - 4k + 4 \leq 0$

$(k-2)^2 \leq 0$

But any perfect square cannot be negative, so the only valid solution arises from $(k-2)^2 = 0$

Therefore, $k = 2$.