Soln POW 10/3/16

Add the two equations and simplify:

$$\frac{2}{x} = (x^2+3y^2)(3x^2+y^2) + 2(y^4-x^4) = x^4 + 10x^2y^2 + 5y^4$$

Subtract the two equations and simplify

$$\frac{1}{y} = (x^2+3y^2)(3x^2+y^2) - 2(y^4-x^4) = 5x^4 + 10x^2y^2 + y^4$$

Multiply the first result by x: $2 = x^5 + 10x^3y^2 + 5y^4x$

Multiply the second result by y: $1 = 5x^4y + 10x^2y^3 + y^5$

add the previous two results and simplify

$$3 = x^5 + 10x^3y + 5xy^4 + 5x^4y + 10x^2y^3 + y^5 = (x+y)^5$$

Subtract the previous two results and simplify

$$1 = x^5 + 10x^3y^2 + 5xy^4 - 5x^4y - 10x^2y^3 - y^5 = (x-y)^5$$

So

$$3^{1/5} = x + y$$

$$1^{1/5} = x - y$$

add $3^{1/5} + 1 = 2x$

$$x = \frac{1}{2}(3^{1/5}+1)$$

subtract $3^{1/5} - 1 = 2y$

$$y = \frac{1}{2}(3^{1/5}-1)$$

$$\boxed{x = \frac{1}{2}(3^{1/5}+1),\ y = \frac{1}{2}(3^{1/5}-1)}$$