

Provide a clear and organized presentation. Show all of your work and provide exact values only. Completely simplify your answer.

$$y^3(x^3 + 3x^2 - 4)\frac{dy}{dx} = (y^2 + \sqrt{y^2 + 3})(x^4 + 5x^3 + 10x^2 + x - 6)$$