

The domain of f is

$$\begin{cases} x^2 + 3x > 0 \\ x \neq 1 \end{cases}$$

So

$$D = (-\infty, -3] \cup [0, 1) \cup (1, \infty)$$

$$f(-3) = -\frac{\sqrt{3}}{2}$$

$$f(0) = -\sqrt{3}$$

$$\lim_{x \rightarrow 1} f(x) = \lim_{x \rightarrow 1} \frac{3 - 3x}{(x-1)(\sqrt{x^2+3} + \sqrt{x^2+3}x)}$$

$$= \lim_{x \rightarrow 1} \frac{-3}{\sqrt{x^2+3} + \sqrt{x^2+3}x}$$

$$= \frac{-3}{4}$$

Thus

$$\begin{cases} 9a - 3b + c = -\frac{\sqrt{3}}{2} \\ c = -\sqrt{3} \\ a + b + c = -\frac{3}{4} \end{cases}$$

$$\begin{cases} a = \frac{7}{24}\sqrt{3} - \frac{3}{16} \\ b = -\frac{9}{16} + \frac{17}{24}\sqrt{3} \\ c = -\sqrt{3} \end{cases}$$