

Exercise 11

Find the limit.

$$\lim_{u \rightarrow 1} \frac{u^4 - 1}{u^3 + 5u^2 - 6u}$$

Solution

Plugging in 1 right away for u gives 0 in the denominator, so simplify the function first or rewrite the limit.

$$\begin{aligned} \lim_{u \rightarrow 1} \frac{u^4 - 1}{u^3 + 5u^2 - 6u} &= \lim_{u \rightarrow 1} \frac{(u^2 + 1)(u^2 - 1)}{u(u^2 + 5u - 6)} \\ &= \lim_{u \rightarrow 1} \frac{(u^2 + 1)(u + 1)(u - 1)}{u(u + 6)(u - 1)} \\ &= \lim_{u \rightarrow 1} \frac{(u^2 + 1)(u + 1)}{u(u + 6)} \\ &= \frac{(1^2 + 1)(1 + 1)}{(1)(1 + 6)} \\ &= \frac{4}{7} \end{aligned}$$