

**Exercise 7**

Find the limit.

$$\lim_{h \rightarrow 0} \frac{(h-1)^3 + 1}{h}$$

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**Solution**

Plugging in 0 right away for  $h$  gives 0 in the denominator, so simplify the function first.

$$\begin{aligned} \lim_{h \rightarrow 0} \frac{(h-1)^3 + 1}{h} &= \lim_{h \rightarrow 0} \frac{(h^3 - 3h^2 + 3h - 1) + 1}{h} \\ &= \lim_{h \rightarrow 0} \frac{h^3 - 3h^2 + 3h}{h} \\ &= \lim_{h \rightarrow 0} \frac{h(h^2 - 3h + 3)}{h} \\ &= \lim_{h \rightarrow 0} (h^2 - 3h + 3) \\ &= 0^2 - 3(0) + 3 \\ &= 3 \end{aligned}$$