

**Exercise 9**

Differentiate.

$$H(u) = (u - \sqrt{u})(u + \sqrt{u})$$

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**Solution**

Use the product rule to differentiate  $H(u)$ .

$$\begin{aligned} H'(u) &= \frac{d}{du} [(u - \sqrt{u})(u + \sqrt{u})] \\ &= \left[ \frac{d}{du} (u - \sqrt{u}) \right] (u + \sqrt{u}) + (u - \sqrt{u}) \left[ \frac{d}{du} (u + \sqrt{u}) \right] \\ &= \left( 1 - \frac{1}{2}u^{-1/2} \right) (u + \sqrt{u}) + (u - \sqrt{u}) \left( 1 + \frac{1}{2}u^{-1/2} \right) \\ &= \left( u + \sqrt{u} - \frac{1}{2}u^{1/2} - \frac{1}{2} \right) + \left( u - \sqrt{u} + \frac{1}{2}u^{1/2} - \frac{1}{2} \right) \\ &= 2u - 1 \end{aligned}$$

Alternatively, expand the function first

$$H(u) = u^2 + u\sqrt{u} - u\sqrt{u} - u = u^2 - u$$

and then differentiate it.

$$H'(u) = 2u - 1$$