

**Exercise 42**

Find the critical numbers of the function.

$$h(t) = 3t - \arcsin t$$

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**Solution**

A critical number is a value of  $t$  for which the derivative is zero or nonexistent. Take the derivative of the function.

$$\begin{aligned} h'(t) &= \frac{d}{dt}(3t - \arcsin t) \\ &= 3 - \frac{1}{\sqrt{1-t^2}} \\ &= \frac{3\sqrt{1-t^2}}{\sqrt{1-t^2}} - \frac{1}{\sqrt{1-t^2}} \\ &= \frac{3\sqrt{1-t^2} - 1}{\sqrt{1-t^2}} \end{aligned}$$

Set what's in the numerator equal to zero and set what's in the denominator equal to zero. Solve these equations for  $t$ .

$$3\sqrt{1-t^2} - 1 = 0$$

$$\sqrt{1-t^2} = 0$$

$$\sqrt{1-t^2} = \frac{1}{3}$$

$$1 - t^2 = 0$$

$$1 - t^2 = \frac{1}{9}$$

$$t^2 = 1$$

$$t^2 = \frac{8}{9}$$

$$t = \pm 1$$

$$t = \pm \frac{\sqrt{8}}{3}$$

$$t = \pm 1$$

$$t = -\frac{2\sqrt{2}}{3} \quad \text{or} \quad t = \frac{2\sqrt{2}}{3}$$

$$t = -1 \quad \text{or} \quad t = 1$$