Exercise 35

Use continuity to evaluate the limit.

$$\lim_{x \to 2} x\sqrt{20 - x^2}$$

Solution

Write the function as a composition and then use Theorem 8 to bring the limit inside the square root function. This theorem applies because the square root function is continuous at 64, the limit of the inner function as $x \to 2$.

$$\begin{aligned}
\lim_{x \to 2} x\sqrt{20 - x^2} &= \lim_{x \to 2} \sqrt{x^2(20 - x^2)} \\
&= \lim_{x \to 2} \sqrt{20x^2 - x^4} \\
&= \sqrt{\lim_{x \to 2}(20x^2 - x^4)} \\
&= \sqrt{20(2)^2 - (2)^4} \\
&= \sqrt{64} \\
&= 8
\end{aligned}$$