

Math 2215 - Calculus 1

Quiz #16 - 2011.05.03

Solutions

1. Compute the following derivatives:

(a) $\lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x}$

$$\begin{aligned}\lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x} &= \lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x} \cdot \frac{\sqrt{x+2} + \sqrt{2}}{\sqrt{x+2} + \sqrt{2}} \\ &= \lim_{x \rightarrow 0} \frac{(x+2) - 2}{x(\sqrt{x+2} + \sqrt{2})} \\ &= \lim_{x \rightarrow 0} \frac{x}{x(\sqrt{x+2} + \sqrt{2})} \\ &= \lim_{x \rightarrow 0} \frac{1}{\sqrt{x+2} + \sqrt{2}} \\ &= \lim_{x \rightarrow 0} \frac{x}{x} \lim_{x \rightarrow 0} \frac{1}{\sqrt{x+2} + \sqrt{2}} \\ &= 1 \cdot \frac{1}{2\sqrt{2}}\end{aligned}$$

(b) $\lim_{x \rightarrow -\infty} \sqrt{\frac{3x^3 - 6x^2 + 5x - 1}{12x^3 - 3x^2 + 7x + 3}}$

$$\begin{aligned}\lim_{x \rightarrow -\infty} \sqrt{\frac{3x^3 - 6x^2 + 5x - 1}{12x^3 - 3x^2 + 7x + 3}} &= \sqrt{\lim_{x \rightarrow -\infty} \frac{3x^3 - 6x^2 + 5x - 1}{12x^3 - 3x^2 + 7x + 3}} \\ &= \sqrt{\frac{3}{12}} \\ &= \frac{1}{2}\end{aligned}$$