

Math 2143 - Brief Calculus with Applications

Quiz #7 - 2008.02.28

Solutions

1. Compute the following limit.

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

2. Find the equation of the tangent line to $f(x) = 3x^3 - 4x^2 + \frac{1}{x} + 2$ at $x = 1$.

First we compute a derivative:

$$f'(x) = 9x^2 - 8x - \frac{1}{x^2} \longrightarrow f'(1) = 9 - 8 - 1 = 0$$

So the tangent line is horizontal, and the equation is $y = f(1)$ or $y = 2$.