Name: ______________________________ **MATH 125**

Date: 09/21 **Quiz 3A**

Problem 1. Find the limit $\lim_{t\to+\infty} \frac{1+\sqrt{t^3}}{2+\sqrt{t}+3t-\sqrt{t^3}}$.(10 points)

Solution.

$$\lim_{t\to+\infty} \frac{1+\sqrt{t^3}}{2+\sqrt{t}+3t-\sqrt{t^3}} = \lim_{t\to+\infty} \frac{\frac{1}{\sqrt{t^3}}+1}{\frac{2}{\sqrt{t^3}}+\frac{1}{t}+\frac{3}{\sqrt{t}}-1} = \frac{1}{-1} = -1.$$

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Problem 2. Find the tangent line of the graph of the function $f(t) = \frac{1}{(t+3)^2}$ at the point $(1, f(1))$.(10 points)

Solution. We have $f(1) = \frac{1}{(1+3)^2} = \frac{1}{4^2} = \frac{1}{16}$ and

$$\begin{aligned} f'(1) &= \lim_{h\to 0} \frac{\frac{1}{(4+h)^2} - \frac{1}{4^2}}{h} = \lim_{h\to 0} \frac{4^2-(4+h)^2}{4^2h(4+h)^2} = \lim_{h\to 0} \frac{-8h-h^2}{16h(4+h)^2} \\ &= \lim_{h\to 0} \frac{-8-h}{16(4+h)^2} = \frac{-8}{16\cdot 4^2} = -\frac{1}{32}, \end{aligned}$$

so the equation of the tangent line to $(1, \frac{1}{16})$ is

$$y - \frac{1}{16} = -\frac{1}{32}(x-1).$$

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Final Score: ______________

Name: ____ **MATH 125**

Date: 09/21 **Quiz 3B**

Problem 1. Find the limit $\lim\limits_{t \to \frac{\pi}{2}+}(x-1)\tan x$.(10 points)

Solution. Note that $\lim_{x\to\frac{\pi}{2}+}(x-1) = \frac{\pi}{2} - 1 > 0$ is a finite real number, and $\lim_{x\to\frac{\pi}{2}+}\tan x = -\infty$, so we have $\lim_{x\to\frac{\pi}{2}+}(x-1)\tan x = -\infty$. ◇

Problem 2. Find the tangent line of the function $f(t) = 1 + 2t + 4t^2$ at the point $(1, f(1))$. (10 points)

Solution. $f(1) = 1 + 2 + 4 = 7$, so we want the tangent line of f at the point $(1, 7)$. The derivative of f at 1 is

$$f'(1) = \lim_{h\to 0}\frac{1 + 2(1+h) + 4(1+h)^2 - 7}{h} = \lim_{h\to 0}\frac{1}{h}(2h + 8h + 4h^2) = 10,$$

so the tangent line of f at $(1, 7)$ is $y - 7 = 10(x-1)$, i.e.

$$y = 10x - 3.$$

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Final Score: ________________