Name: ______________________ **MATH 125**
Date: 09/17 **Quiz 2C**

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

Solution.

$$\lim_{x\to -1}\left(\frac{1}{x+1} - \frac{2}{1-x^2}\right) = \lim_{x\to -1}\left(\frac{1-x}{1-x^2} - \frac{2}{1-x^2}\right) = \lim_{x\to -1}\frac{1-x-2}{1-x^2}$$
$$= \lim_{x\to -1}\frac{-(1+x)}{(1-x)(1+x)} = \lim_{x\to -1}\frac{-1}{1-x} = -\frac{1}{2}.$$ ◇

Problem 2. Find the limit $\lim_{x\to 1}\frac{\tan(\pi x)}{x-1}$.(10 points)
[Hint: $\sin x = -\sin(x-\pi)$.]

Solution.

$$\lim_{x\to 1}\frac{\tan(\pi x)}{x-1} = \lim_{x\to 1}\frac{\sin(\pi x)}{\cos(\pi x)(x-1)} = \lim_{x\to 1}\frac{-\sin(\pi x-\pi)}{x-1}\lim_{x\to 1}\frac{1}{\cos(\pi x)}$$
$$= \lim_{x\to 1}\pi\cdot\frac{-\sin\pi(x-1)}{\pi(x-1)}\cdot(-1) = -\pi\cdot(-1) = \pi.$$ ◇

Problem 3. Show that there's a root of the equation $2x^3 - 5x + 1 = 0$ in the interval $(0,1)$.(10 points)

Solution. Let $f(x) = 2x^3 - 5x + 1$, then we have $f(0) = 1 > 0$ and $f(1) = -2 < 0$, so by the Intermediate Value Theorem, f has a root in the interval $(0,1)$. ◇

Final Score: ______________