Dawson College: **Calculus I**: 201-NYA-05-S4: Winter 2012

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Quiz 5

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §2.4 #75 *(2 marks)* Find the indicated limits, if they exist.

$$\lim_{x\to-\infty}\frac{3x^3+x^2+1}{x^3+1} = \lim_{x\to-\infty}\frac{(3x^3+x^2+1)\left(\frac{1}{x^3}\right)}{(x^3+1)\left(\frac{1}{x^3}\right)}$$

$$= \lim_{x\to-\infty}\frac{\left(3+\cancel{\frac{1}{x}}^{\to 0}+\cancel{\frac{1}{x^3}}^{\to 0}\right)}{1+\cancel{\frac{1}{x^3}}^{\to 0}} = \frac{3}{1} = 3$$

Question 2. §2.5 #54 *(3 marks)* Find the values of x for which each function is continuous.

$$f(x)=\begin{cases}-2x+1 & \text{if } x<0\\ x^2+1 & \text{if } x\geq 0\end{cases}$$

$f(x)$ is continuous for $x<0$ since $-2x+1$ is a polynomial.

$f(x)$ is continuous for $x>0$ since x^2+1 is a polynomial.

at $x=0$

(1) $f(0)=1$, so defined

(2) $\lim_{x\to0^-} f(x)=1=\lim_{x\to0^+} f(x)$

(3) $\lim_{x\to0} f(x)=1=f(0)$

$\therefore$ continuous at $x=0$.

Question 3. §2.6 #26 Let

$$f(x)=\frac{1}{x-1}$$

a. *(3 marks)* Find the derivative f' of f.

b. *(2 marks)* Find an equation of the tangent line to the curve at the point $(-1,-\frac{1}{2})$.

a) $$f'(x)=\lim_{h\to0}\frac{f(x+h)-f(x)}{h}$$

$$=\lim_{h\to0}\frac{\frac{1}{x+h-1}-\frac{1}{x-1}}{h}$$

$$=\lim_{h\to0}\frac{\frac{x-1}{(x+h-1)(x-1)}-\frac{x+h-1}{(x-1)(x+h-1)}}{h}$$

$$=\lim_{h\to0}\frac{\frac{x-1-x-h+1}{(x+h-1)(x-1)}}{h}$$

$$=\lim_{h\to0}\frac{-\cancel{h}}{\cancel{h}(x+h-1)(x-1)} = \frac{-1}{(x-1)^2}$$

b) Let's find the slope at $x=-1$

$$m=f'(-1)=\frac{-1}{(-1-1)^2}=\frac{-1}{4}$$

So $y=mx+b$

$y=\left(\frac{-1}{4}\right)x+b$ sub $(-1,-\frac{1}{2})$ to solve for b.

$-\frac{1}{2}=\left(\frac{-1}{4}\right)(-1)+b$

$\frac{-3}{4}=b$

$\therefore\ y=\frac{-1}{4}x-\frac{3}{4}$