King Fahd University of Petroleum &Minerals
Department of Mathematical Sciences

Quiz 2 Math101-5 Semester 032

I.D.#: Ser.#: Name:

Q1. Find x-coordinate of the points so that the graph of $f(x)=\dfrac{x^2+1}{2x+1}$ has **horizontal** tangent line.

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

$$f'(x)=0 \Rightarrow 2x^2+2x-2=0 \Rightarrow x^2+x-1=0$$

$$x=\frac{-1\pm\sqrt{1-4(1)(-1)}}{2}=\frac{-1\pm\sqrt{5}}{2}$$

Q2. Let $f(x)=\dfrac{1}{x+2}$. Use the **definition** of the derivative to find $f'(x)$.

$$f'(x)=\lim_{w\to x}\frac{\frac{1}{w+2}-\frac{1}{x+2}}{w-x}=\lim_{w\to x}\frac{\frac{x+2-(w+2)}{(w+2)(x+2)}}{w-x}=\lim_{w\to x}\frac{x-w}{(w-x)(w+2)(x+2)}$$

$$=\lim_{w\to x}\frac{-1}{(w+2)(x+2)}=\frac{-1}{(x+2)(x+2)}=\frac{-1}{(x+2)^2}$$

Q3. Find k if the curve $y=2x^2+3x-2$ is tangent to the line $y=5x-2k$.

$\dfrac{dy}{dx}=4x+3$

slope of $y=5x-2k$ is 5 $\Rightarrow 4x+3=5 \Rightarrow x=\frac{1}{2}$

$\therefore y=2\left(\frac{1}{2}\right)^2+3\left(\frac{1}{2}\right)-2=\frac{1}{2}+\frac{3}{2}-2=0$

The tangent point is $\left(\frac{1}{2},0\right) \Rightarrow 0=5\left(\frac{1}{2}\right)-2k$

$\Rightarrow 2k=\frac{5}{2}$ $k=\frac{5}{4}$