AP Calculus AB Mr. Shubleka Quiz: 12

Present neatly ~~on separate paper~~. Justify for full credit. No Calculators.

Name SHUBLEKA / KEY Score _______ ~10 minutes

1. Consider the function $f(x)=\frac{2}{x}+\sqrt{x}$. Use the definition of slope to determine the equation of the tangent line at the point on the curve where $x=a$. [8 points]

2. Each limit represents the derivative of some function at some number. State such an *f* and *a* in each case. [2 points]

a)

$$\lim_{h\to 0}\frac{\sqrt[4]{16+h}-2}{h}$$

$f(x)=\sqrt[4]{x}$

$x=a=16$

b)

$$\lim_{x\to 1}\frac{x^{17}-1}{x-1}$$

$f(x)=x^{17}$

$x=a=1$

① $$f'(a)=\text{slope}=\lim_{x\to a}\frac{f(x)-f(a)}{x-a}=\lim_{x\to a}\frac{\left(\frac{2}{x}+\sqrt{x}\right)-\left(\frac{2}{a}+\sqrt{a}\right)}{x-a}$$

$$=\lim_{x\to a}\left[\frac{\frac{2}{x}-\frac{2}{a}}{x-a}+\frac{\sqrt{x}-\sqrt{a}}{x-a}\right]=\lim_{x\to a}\left(\frac{2(a-\cancel{x})}{ax(x-a)}+\frac{(\sqrt{x}-\sqrt{a})}{(x-a)}\frac{(\sqrt{x}+\sqrt{a})}{\sqrt{x}+\sqrt{a}}\right)$$

$$=\lim_{x\to a}\left(\frac{-2}{ax}+\frac{(x-a)}{(x-a)(\sqrt{x}+\sqrt{a})}\right)=\frac{-2}{a^2}+\frac{1}{2\sqrt{a}}$$

Point: $\left(a,\ \frac{2}{a}+\sqrt{a}\right)$ Slope: $\frac{1}{2\sqrt{a}}-\frac{2}{a^2}$ Equation of Tangent:

$$y-\left(\frac{2}{a}+\sqrt{a}\right)=\left(\frac{1}{2\sqrt{a}}-\frac{2}{a^2}\right)(x-a)$$

As an exercise, try the other definition:

$$f'(a)=\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}=\ldots$$