Mirror, mirror on the wall, who's the smartest of them all: Key

AP Calculus AB: 3.2 Definition of a Derivative

1) Find the derivative of the function $g(x) = 4x^2 - 5$ at the point x=2. Identify what that value means.

$g'(x) = 8x$

$g'(2) = 16$ this is the slope of $g(x)$ at $x=2$

2) Find the instantaneous rate of change of the function $g(x) = 2x^2 - x$ at the point x=1. Identify what that value means.

$g'(x) = 4x - 1$

$g'(1) = 3$

3) Evaluate $\lim_{x\to 0} \frac{f(x)-f(0)}{x^2}$, if the function $f(x) = 3x^2 + 2$.

$$\lim_{x\to 0} \frac{(3x^2+2)-(3(0)^2+2)}{x^2} = \lim_{x\to 0} \frac{3x^2+\cancel{2}-\cancel{2}}{x^2} = \lim_{x\to 0} \frac{3\cancel{x^2}}{\cancel{x^2}} = \lim_{x\to 0} 3$$

$$\boxed{\lim_{x\to 0} \frac{f(x)-f(0)}{x^2} = 3}$$

4) Which is equal to $f'(x)$ if $f(x) = 3x^2 - 5x$

I. $\lim_{h\to 0} \frac{(3x+h)^2-(5x+h)-(3x^2-5x)}{h}$ II. $\lim_{h\to 0} \frac{3(x+h)^2-5(x+h)-3x^2+5x}{h}$ III. $\lim_{h\to 0} \frac{3(x+h)^2-5(x+h)-3x^2-5x}{h}$

5) Which is equal to $f'(2)$ if $f(x) = 4x^2 - 5$

I. $\lim_{h\to 0} \frac{4(x+2)^2-5-(4x^2-5)}{h}$ II. $\lim_{h\to 0} \frac{4(2+h)^2-5-(4(2)^2-5)}{h}$