Quiz 4

Fundamentals of Calculus I

Last 4 Digits of Student ID: _____

Explain and justify your thought process.

1. Find the slope of the tangent line to the function $(1 + 2x + 3x^2)(5x + 8x^2 - x^3)(2x)$ at $x = 1$.

No justification necessary.

2. When is the product rule useful?

3. State the limit definition of continuity.

4. Find the derivative of $\frac{1}{x}$.

True or False. No justification necessary.

5. _____ $\frac{d}{dx}\pi = 0$
6. _____ The y-intercept of the secant line is the derivative
7. _____ The derivative of a function is also a function

Explain and justify your thought process.

1. Find the slope of the tangent line to the function $(1+2x+3x^2)(5x+8x^2-x^3)(2x)$ at $x=1$.
   The slope of the tangent line at $x=1$ is the value of the derivative at 1. To find the derivative, we have two options:
   * multiply the expression and use the power rule
   * group the expression as the product of two functions and use the product rule
   For the product rule, we call
   $f(x)=1+2x+3x^2$
   and $g(x)=10x^2+16x^3-2x^4$.
   Then by the power rule, $f'(x)=2+6x$
   and $g'(x)=20x+48x^2-8x^3$.
   By the product rule the derivative is

$$f(x)g'(x)+g(x)f'(x)=(1+2x+3x^2)(20x+48x^2-8x^3)\\+(10x^2+16x^3-2x^4)(2+6x)$$

   At x =1, this expression equals

$$(1+2+3)(20+48-8)+(10+16-2)(2+6)=6*60+24*8=552.$$

   Therefore, the slope of the tanget line at $x=1$ is 552.

No justification necessary.

2. When is the product rule useful?
   The product rule is used to find the derivative of a function comprised of two functions multiplied by one another.

3. State the limit definition of continuity at a point $x=c$.
   $\lim_{x\to c} f(x)=f(c)$

4. Find the derivative of $\dfrac{1}{x}$.
   First rewrite the function as x^{-1} then use the power rule: $-x^{-2}$.

True or False. No justification necessary.

5. True $\dfrac{d}{dx}\pi=0$
6. False The y-intercept of the secant line is the derivative
7. True The derivative of a function is also a function